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Editorial

Man has been exploiting the earth for the satisfaction of not just his needs, but his unquenching greed. He used it as a testing ground for showing his skill as if it were his domain. Possessed of superior intelligence and self-consciousness he stood out from all the rest and considered himself the 'crown of creation' and commissioned, as it were, to 'subdue the earth'. In this kind of rationalization and misuse of earthly goods he apparently forgot the fact that the whole creation constituted a harmonious whole of which he was an integral part and that he could not, therefore, pollute and poison the earth and its environment with impunity. Now that nature has sounded a clear but stern warning against his reckless attack on her he has become aware of the grave ecological problems facing him. As Pope John Paul II says in his encyclical *Sollicitudo Rei Socialis* (art. 26) the present ecological concern of people all over the world is something positive because such an awareness is a basic requirement for any remedial action.

This issue of *Jeevadhara* focuses on some of the important ecological issues and concerns. Prof. S. Sivadas, a Chemist by profession and deeply involved in national and international endeavours to protect the environment, writes about "A new gospel on nature". Free from all scientific jargon and "dryness", the article elucidates the oneness of nature as well as the various injuries inflicted on her through man's greedy and reckless ventures which ultimately threaten his very survival on this planet. Today many are aware that environmental pollution is behind several present-day ailments. Dr. Mathew Parakkal, retired Professor of Medicine and very active in the promotion of healthy environment, imparts scientific information on health hazards caused by various environmental problems like Greenhouse effect, ozone depletion, deforestation, land-air-water pollution, radiation and the like. It makes amply clear how extensively our health and well-being can be injured by polluted environments. Forests have a vital role in maintaining environmental balance and preserving natural resources

Mr. Joseph K. Kurian, retired Divisional Forest Officer with first hand experience and expertise in the field, examines the role forests play in the protection of the environment. Dr. Sangamitra Desai Gadekar of Samporna Kranti Vidyalaya, in her short report, gives us a glimpse of the horrific things happening around Rawatbhata nuclear reactors in Rajasthan, which the politicians and the Atomic Energy Department are trying to cover up, when the whole world is pressurized to develop alternate sources of energy. It is high time that the people woke up to the seriousness of the situation and call a halt.

The ecological crisis has its roots in man, in his vision of himself, of the whole creation and their interrelationships, in his value-system and priorities, all of which relate to the religio-moral dimensions of the crisis. Rev. Dr. George Therukattil MCBS, Professor of Christian Theology at the University of Mysore, discusses different ecological interpretations of the Bible and calls for a biblical eco-theology of interrelationship. The last article on the ethical implications and challenges of the ecological problem is by Rev. Dr. S. Arokiasamy S. J., Professor of Christian Ethics at Vidyajyoti, Delhi. He emphasizes the need for an eco-ethics focusing on the values of participation, justice, and wholeness, based on the relationality prevailing in the whole of creation.

Besides stressing the oneness of the whole creation and the importance of respecting it, all the authors strongly feel that the ecological awareness that has grown among peoples recently should now be concretized into earnest and concerted efforts geared to the protection of the environment, which is the urgent need of the hour.

Lastly, *Jeevadhara* owes an immense debt of gratitude to Rev. Dr. Felix Podimattam ofm cap. who has been editing this issue very ably from 1973-1990. We hope he will continue to offer his service to us also in the future.

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Thomas Srampickal

A New Gospel on Nature

It is high time that we preached a new gospel, the gospel on environmental protection, sustainable development and environmental ethics for the twentyfirst century. High time because we are on the verge of total doom, for our mother earth is a tiny spaceship drifting in the vast expanse of the unending ocean of space, with the precious and beautiful phenomenon of life in her bosom, weeping and trembling because of the numerous fatal holes inflicted on her bottom by the greedy human race of this century. This tiny spaceship may sink, doomsday may come when all the beauties of life disappear and earth may become lifeless. Let all people who love this world awake and become missionaries for preaching the new gospel of nature conservation for the sake of our children of tomorrow.

Earth too big!

To be able to preach the gospel of nature, we should first of all see nature as part of a great universe which consists of at least 100 billion galaxies. Our own earth and the whole solar system belongs to the Milky Way, just one of those galaxies. This Milky Way is itself too big to be imagined. Compared to this giant group of stars, numbering several billions, the sun is but a dot, and our earth is too small to compare with the sun. But then this tiny earth is too large for us to imagine. Its (polar) diameter is about 12,714 km. The crust of the earth is thin, varying from 8 to 40 km. Even Mt Everest has a height of only about 9 km. But the crust is merely a skin on the giant earth – just like that of a tomato. Even with all the engineering skills and complex instruments we have not been able to drill beyond this crust.

It is only on this skin of the earth (crust) that conditions became ripe for the existence of life; life originated there, developed into numerous complex patterns, evolved and culminated

in the appearance of man. Man always thought that he is unique, the master of this earth, the most essential form of life.

However, compared to the very long history of the earth, that of man is too short. If we 'reduce' the very long time-span from the birth of the earth to the present day to just 24 hrs, the story of man starts just 40 seconds before the end of the 24 hour period, the whole recorded history of man, the so-called grand brave history, shrinks to just 0.1 second. Let us imbibe the spirit of this ecological time-table and become humble and ready to respect nature and its complex life-forms.

Nature: complex but one

On this thin crust of the earth there is a complex net-work of living forms. These millions of types of living organisms are inter-connected by several known and unknown bonds. Food-chain is only one among them. For example, if all grass is destroyed the species of deer may disappear from the face of the earth and ultimately lions. That is only one of the thousands of food-chains maintained in nature. If there is drought grass may dry. The effect will be felt by not only deer but lions too. So our nature should be considered a very complex, intricate, delicate and beautifully balanced net-work with thousands of known and unknown bonds connecting all living and non-living things in it. Soil, water, air, sun rays etc. are some of the important non-living things or factors of this network of nature. This is the basis of ecology. It is foolish to study a plant or an animal as a totally separate entity. It should be understood as part of the ecological network only, and then our study becomes clear and meaningful.

What is the position of man in this intricate ecological network? There are millions of types of living things on the face of the earth. They creep, walk, run, fly or remain still in their ecological environment and try to get food and mate and maintain their race. All of these living organisms appeared on earth much before man was born. Many of them have even better survival instincts too!

Nothing will happen to this world even if man disappeared from the earth, except that the so called civilized creatures and their disturbances disappear and a serene nature is left to survive. It is definitely a blow to the pride of ego-filled man to think that the world will still go smoothly even if humans disappeared from the

earth. But what will happen if micro organisms — the microscopic living beings — were to disappear from the earth. Alas, much commotion will emerge. The dead body won't decay, food won't digest, milk won't turn to curd and so on. The equilibrium in nature will be disturbed and even man may ultimately perish! Yes, in the ecological net-work more harm is done if a 'lower' knot is cut. Still man imagines that he is the most vital part of nature!

But man is unique

One must admit the fact that even though man has no uniqueness in the ecological point of view, man is the most powerful creature on earth. He is the only creature who can consciously alter nature, the only one agency who can make this world a heaven or a hell. He can even destroy all the living things on the earth (including himself). He is also the only living being endowed with 'wisdom' so that he can decide whether to save the earth or destroy it. So man assumes a crucial position in nature, he is forced to take full responsibility for the welfare not only of his race, but of others also. He has the ethical responsibility to ensure the well being and safety of other creations in nature. Only man who has not only scientific wisdom, but ethical backbone too can take correct decisions in this crucial moment. He must also know that the decision if it goes wrong not only destroys other creatures, but himself too. Nature conservation is not to satisfy our aesthetic sense, but to ensure our very existence.

Frustrating position

So it is high time that all men and women who wish that their children should be able to live on this earth began to understand the present position of nature. World Commission on Environment and Development of the United Nations summarized the present situation of world environment as follows:

"When the century began, neither human numbers nor technology had the power radically to alter planetary systems. As the century closes, not only do vastly increased human numbers and their activities have that power, but major, unintended changes are occurring in the atmosphere, in soils, in waters, among plants and animals, and in the relationships among all these. The rate of change is outstripping the ability of scientific disciplines and our capabilities to assess

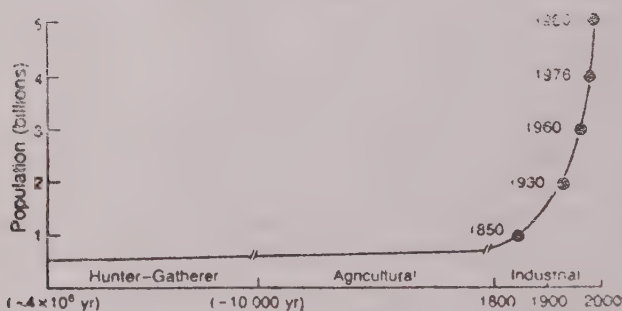
and advise. It is frustrating the attempts of political and economic institutions which evolved in a different, more fragmented world, to adopt and cope."

Why does the World Commission feel so much frustration? Simply because of so many shocking threats to nature, which make the problem of its conservation almost impossible.

Population explosion

Consider the problem of human numbers first. We know that there is the population explosion and the 5 billion mark was reached in July 1986. This jump in population began with industrial progress and the graph only goes up and never shows any sign of decline. (see graph below)

World Population Growth



This population explosion is really a grave problem to earth. In the next century the world population may increase to the alarming figure of 8 to 14 billion. More than 90% of the increase will occur in the poorest countries, and of that, 90% in the world's already bursting cities. These poor people will naturally try to improve their standard of living too. Profit seeking manufacturers are introducing more and more unnecessary consumer goods to these nations and skillfully compelling even the poor people to buy them. These compulsions increase the demand for more and more products – both necessary and unnecessary.

The result is that industrial production will have to be increased further. Remember that industrial production has already grown more than 50 fold over the past century, with four fifths of this growth since 1950. The world manufactures seven times more products today than it did in 1950. As population increases,

manufacture will also increase. In the next century it may still increase by about 10 fold. Developing countries in their eagerness to increase the standard of living of their citizens will be forced to step up manufacture even at the sacrifice of environmental concerns. These activities will definitely increase pollution and will destroy valuable natural resources like timber, coal, petroleum, fertile land etc.

Energy needs of developing countries will increase too. People in developed nations are now really squandering energy! So much energy need not be consumed at all for good, quality life. Actually such unscientific, uncontrolled and unimaginative consumption of energy is a crime and it really pollutes their country and threatens their very existence. But they don't realise the gravity of their crime.

The following data substantiate what we have explained now. The energy requirements of primitive men were very low. His daily requirement was equivalent to 0.3 kg of coal. But a man in industrialised society began to consume energy equivalent to about 12 kgs of coal daily. The average consumption of an Indian is still equivalent to about 1.4 kgs which is approximately the energy consumption of primitive agricultural man. A man in a highly industrialised and developed nation (like USA) consumes energy equivalent to about 35 kg of coal daily.

Thus on the one side the 'technology man' of USA, for one, indiscriminately destroys the resources of nature and swallows up unnecessary amount of energy. He is, just like a mad elephant in a sugarcane field, eating madly and destroying unnecessarily the mother earth. But people in poor and developing nations still live like primitive agricultural man with very low energy use.

These nations now see the 'Americans' as model. They want to have more energy, more facilities, more consumer articles and so on. We cannot blame them, they should be provided with at least the minimum energy required to live a civilized life. Thus the energy requirements of such nations (including India) is going to increase substantially. If the developing countries want to increase their consumption of energy up to the level of industrialized countries the world energy production has to be increased to five fold (according to "World Commission on Environment and Development: Our common future"). Most of the developing

countries are going to erect more thermal and other power stations for this purpose. More non-renewable resources are going to be depleted. More carbon dioxide and toxic gases are going to be released to the atmosphere. Mother earth with its delicate balances in the soil, in the atmosphere etc. is going to be disturbed by this. Actually our planetary eco-systems cannot sustain such an increase in energy production. What is a way out? People like Americans should decide to use less energy and people like Indians to conserve more energy. The dream of every body becoming an American should be abandoned not only by 'Indians' but even by Americans themselves!

As population is increasing, more and more forest areas are destroyed and converted as agricultural lands. Intensive and indiscriminate cultivation destroys the productivity of lands and pollutes water and air. Destruction of forest results in soil erosion and desertification. Each year six million hectares (14.8 million acres) of productive land are turned into worthless desert creating in three decades an area roughly the size of Saudi Arabia.

The food demand is also increasing day by day. Actually enough food to feed all men in this world is being produced even now. But poor people have no purchasing power to buy food. Scarcity is also created due to market restrictions and profit requirements. Production increases, but more people are pushed down below poverty line. World Bank defines 'food insecure' people as people not having enough food for normal health and physical activity. In Africa alone more than 10 million people are 'food insecure' (World Bank report on the Task Force on Food Security in Africa. Washington DC. World Bank 1988). Increase of population, adverse climatic effects (see below) etc. is going to worsen the plight of starving millions when their rulers are planning budgets with greater allotment for defence !

Global warming

Global warming is another sign of unsustainability exhibited by nature. "Global warming has begun and we had better start preparing for the dramatic changes to come" comments the senior editor of *Discover*, Mr. Andrew C. Revkin (Oct, 1988). What is this Problem? What is the new popular phenomenon called 'Green house effect' ?

In 1822 Jean Fourier compared the earth's atmosphere to the glass of a green house. Both let the sun's visible rays enter to warm land, water, plants and air, but retard the escape of heat. If earth had no atmosphere the escape of heat would have been so great that the earth would have frozen and become lifeless as Mars. It is the atmospheric gases that helps to retain the heat so that an average temperature of about 15°C (59°F) is maintained here.

This effect of atmospheric gases in preventing the escape of heat and thereby warming the earth is later called Green house effect. Countless measurements from satellites, weather balloons and ground stations establish that Green house effect is real. Really this is required for the existence of life on earth since it retains required heat. Thus green house effect existed here when life began its drama on earth. Carbon dioxide is the most important Green house gas (next only to water vapour).

Some 20,000 years ago (in the last glacial age) average world temperature was about 9 degrees less than today. Then the carbon dioxide level in the atmosphere was only about 200 parts per million (ppm). It rose to 280 ppm by the beginning of the industrial age. By the middle of the coming century the level of carbon dioxide is supposed to reach about 600 ppm. This gas lasts upto a hundred years in the atmosphere and contributes to half the man-made share of global warming.

One need not blame carbon dioxide which is really sustaining the living organisms of this world by the wonderful process of photo-synthesis. The amount of carbon dioxide and for that matter carbon in the atmosphere of the earth is really regulated by interaction of air, rock, sea and life forms. Plants breathe out carbon dioxide but take it in during photosynthesis and convert it into food for them and for all animals too. The total amount of carbon dioxide thus fixed in organic compounds is really huge. But decay of plants and animals replace the carbon dioxide absorbed by plants. Thus there is an equilibrium. It was only when our industrial activity soared to maddening heights that the release of carbondioxide to the atmosphere increased terribly and the long maintained balance was disturbed. The amount of carbon dioxide increased very much and its green house effect began to heat the globe alarmingly.

There are so many other gases also which act as green house gases. Methane (marsh gas) is one such. Cattle is a known source of methane. The bacteria that helps the cattle to digest hay or grass (cellulose materials) is also making methane in the guts of cattle. A head of cattle on an average emits roughly 14 cubic feet of methane gas a day! Methane is also formed by the bacterial activity on plant residues (agricultural wastes) in paddy fields, gobai gas plants etc. Some of it escape to the atmosphere. It lasts ten years in the atmosphere, but it absorbs 20-30 times more heat than carbondioxide. Really methane contributes to 15-20 percent share of man-made global warming.

CFCs (see below) which are notorious in depleting ozone layer is a more powerful green house gas. They survive as long as 400 years and are 16,000 times more effective than carbon-dioxide in absorbing heat. They contribute about 20 percent share in man-made global warming.

So many other gases are also green house gases: one example is nitrous oxide (laughing gas) which lasts up to 180 years and is 200 times more effective than carbondioxide in absorbing heat.

There are very many Institutions in the world doing research on predicting the effect of global warming. Using super computers they are engaged in model studies and predicting the extent of global warming in the coming century. They say that the global temperature may rise upto 2 to 5 °C. in the next 50-100 years. This will cause drought and desertification in areas that are now fertile and arable. It may change the pattern of tropical monsoon rains that are controlling the vegetation and agriculture in Africa, Asia and South America. It may melt polar ice caps, sea levels may rise by about 6 metres (20ft). Even if the sea level is raised to only 1 meter it would inundate large population centres and much fertile land. Cities built near sea shore and islands will be in jeopardy. About 30 percent of Bangladesh may go under water! There about 30 percent of its population would be displaced from their traditional land mass. In Egypt only 4% of land is arable. If the sea level rises large areas of this arable land mass in Egypt would be flooded and food production would drop. There 8.5 million people may be forced out of their traditional homes. When arable land mass is reduced and rise of sea level

increases salinity of larger areas of agricultural fields, these people who are forced out of their traditional agricultural land mass can go nowhere. It is expected that the rise of sea level may create 50 million refugees in the next century – not political but environmental refugees! Not only larger areas would become unfit for cultivation owing to increase of salinity, but large areas of wet land, which presently supply fish to the millions of people would get destroyed creating protein hunger. Displaced people, less arable land, less wet land for fishing, more drought, more erosion by sea...these problems coupled with the increase in world population may create ecological disaster on this earth.

Global warming may increase precipitation since warmer air may create more clouds. This may change the weather pattern, desert may shift positions, fertile land may become deserts, but new land getting rain may not be cultivable due to other factors. A change in climate and reorientation of existing geographical patterns may themselves cause ecological disasters and increase the number of environmental refugees.

Will the rise in the level of carbondioxide increase photosynthesis? May be, but not always, since global temperature is increasing. Other pollutants like sulphur dioxide and oxides of nitrogen which are increasing day by day also will come into play. These toxic gases and the acid rains which they produce may destroy a large amount of vegetation. Scientists find it difficult to predict future weather since several factors come into play in deciding the climate.

Ozone hole

Now let us consider another danger threatening the very existence of life on earth. That is the notorious 'ozone hole' seen above the Antarctic.

Ozone (O_3) is a form of oxygen with three atoms of oxygen in its molecule instead of the usual two in ordinary oxygen (O_2). It is created in the upper part of the atmosphere when gaseous oxygen is split by ultra-violet light.

As early as 1970 there was prediction that the fragile ozone shield of upper atmosphere might be endangered. It was predicted that the oxides of nitrogen released from supersonic planes may cause this harm. But in 1974 a more dangerous group of

chemicals called chloro fluoro carbons was suspected to be more dangerous ozone depleters.

In 1985 British researchers published data that convincingly proved that there is a large reduction in ozone concentration over the Antarctic. It was later proved that this 'hole' appeared every Antarctic spring and it has grown bigger.

We now know that the major cause of the Antarctic ozone hole is man-made chlorine and bromine compounds. CFCs and Halons are the most important among them. CFCs (Chloro Fluoro Carbons) constitute a family of man-made chemicals invented in 1930s. They are used as aerosols and also for refrigeration, air conditioning, dry cleaning, fast food packing etc. Halons are chloro fluoro bromo carbons used in fire extinguishers. They are stable, non-inflammable and non-toxic. Since they are stable they have long life span in the atmosphere. Thus they enter the atmosphere, remain there, get transported to upper atmosphere (stratosphere). But once they reach there unfiltered ultra-violet light is able to decompose them, releasing free chlorine or bromine which being very reactive act as ozone eaters. They are not destroyed in this process of decomposition of ozone to oxygen, they simply catalyse the process and hence they can go on doing this harm over and over again. For example a single chlorine atom can destroy thousands of molecules of ozone.

In peculiar weather conditions in the Antarctic atmosphere this process is speeded up by ice crystals in the stratospheric clouds. This does not mean that ozone is not depleted over other atmospheres. CFCs are evenly distributed over the globe and hence the possibility is that ozone umbrella is getting eroded throughout the atmosphere, may be to a lesser extent.

The atmospheric chemistry is very complicated and hence present model studies are not able to predict exactly what is going to happen by this alarming phenomenon. There is no doubt that things will get worse. It is predicted by scientists that an ozone depletion of 4-12% will take place in high altitudes and 0-4% in the tropics by the year 2050 even without taking into account the peculiar effects over the poles. It is this ozone umbrella which absorbs most of the high energy ultra violet light from the sun (UV-A), which is highly injurious to all forms of life.

The portion of sun's UV light that is partially absorbed by ozone lies between wave lengths 290 to 320 nanometres, which is known as UV-B. Thinning of ozone layer will allow more of UV-B to come to the earth. This may cause sun burns, snow blindness, eye damage, skin cancer and the aging of skin. Increased concentration of UV-B may affect plants too. So far some 200 different species of plants have been tested against UV-B sensitivity and about two thirds of them produced reactions. Sensitive species such as cotton, peas, beans etc. grow more slowly. Some pollens fail to germinate too. UV-B damages plant hormones and chlorophyll. If these are damaged rate of photosynthesis may decrease.

Both animal and plant plankton are damaged by UV-B radiation. Study indicates that a twenty five percent reduction in ozone would lead to 10% loss in primary production in the biologically rich upper layer of the ocean and 35% reduction near the surface of water. Plankton makes up the base of the marine food chain and their damage will badly influence fish and shell fish production.

Increased UV light on the surface of the earth may aggravate problems with photo-chemical smog. UV in higher concentrations damage polymers used in buildings, paints etc.

Thus the life on earth is going to disappear if ozone is depleted at this rate. This is a global problem — all nations irrespective of cast or creed or colour is going to perish. Hence in 1987 an international agreement to protect the environment from these toxic chemicals was arrived at in Montreal, Canada. This Montreal treaty called for a drastic cut in the production and consumption of CFCs. In 1990 a complete phase-out of CFCs by the end of the present century was called by UN agency. Research for developing ozone friendly substances as substitutes for CFCs are also progressing. Only if all nations co-operate any success can be achieved in this struggle for saving ozone umbrella.

Genetic engineering

Modern technological progress gives more powerful ways for man to control nature. Genetic engineering is one among them. Genes are the carriers of hereditary characters. Until now creation was an area where man was not able to interfere. But with the development in genetic engineering man is able to manipulate the gene, he is able to introduce new traits into the gene. This

results in forms of life hitherto unknown to nature. This challenging field has so many good applications, but bad too. What is going to be the face of the earth with the new varieties of life forms introduced by man in the coming future? Once a life form like a virus capable of spreading a dreadful unknown disease comes out and multiplies and begins the death dance, man will not be able to control it or correct it. Genetic engineering is going to alter nature much, if it is to be for good. The people doing this research should have the moral back bone not to destroy mother earth.

Environmental challenges are very many. The threat of nuclear weapons, biological war, pollution due to insecticides etc. are not described here because of lack of space.

Attitudinal change and concerted action

What is a way out? Man's outlook should radically change. All the developments he undertakes should be always sustainable developments. "Sustainable development is a process of social and economic betterment that satisfies the needs and values of all interest groups, while maintaining future options and conserving natural resources and diversity." Such a development should ensure ecological, social, cultural and economic sustainability. Such a development should be "based on universal values concerning people's relationships with nature and each other".

This is possible only if people are able to respect nature and accept that every life form is unique. Simply by teaching science, this ecological aesthetics cannot be inculcated in man. Even from childhood man must be taught the wonders of nature, the architectural beauty of creation, the imagination and skill exhibited by nature to maintain life on this earth.

Yes, as far as we know, this beautiful phenomenon of life exists only on this earth. If it gets destroyed nobody is going to survive. Even the richest or wisest cannot escape and go to some "gulf country" outside our globe! So it is time for us all to come together and act together. Let us forget all cast, creed or colour of people in this world. Let us not try to build more barriers in terms of political systems or religious beliefs. Environmental threats are global threats. We are in a global emergency. Awake, Oh sons and daughters of this beautiful mother earth, fight for her

safety, work for the conservation of global nature. Let us pray that this earth exists for our children and their children to live in peace.

S. Sivadas

References

- 1) World Commission on Environment and Development. Our common future, Oxford University Press, 1987
- 2) World Bank Report of the Task Force on Food Security in Africa, Washington D. C. World Bank 1988
- 3) 'The Ozone Layer', UNEP/GEMS Environment Library No.2, P O Box 30552. Nairobi, Kenya
- 4) Saving the Ozone Layer, A global Task, Swedish Society for the Conservation of Nature.
- 5) Is Our World Warming ! Samuel W. Matthews, National Geographic, October, 1990.

Environmental Diseases

Environmental medicine or environmental diseases

In a broad sense this is a section of the field of Medicine, that deals with diseases arising out of the influence of environmental factors. In a limited sense, it is confined to diseases resulting from the impact of environmental degradation factors which arise as a result of human activity. There has been an increased awareness of environmental problems during the last 4 decades and all over the world they are receiving increasing attention. This discussion is confined to the study of health hazards due to environmental problems.

“Health” is a state of complete well being, not merely the absence of diseases. It has several dimensions, namely physical, mental, spiritual, social, nutritional, environmental and sexual.

Environment refers to the conditions within and around the human body or any organism, which affect behaviour growth and development of life process directly or indirectly, including those with which the human body interacts. The subject under consideration confines itself to external environmental factors and they are grouped under the following heads – namely, physical, chemical, biological and socio-economic-cultural factors.

Physical: Temperature, wind, rain, dust, soil, open space, energy, noise, debris and radioactivity

Chemical: Water quality, air quality, solid waste (gases) odour, energy sources, material and chemical.

Biological: Flora, fauna, biological diversity, and pathogens,

Socio-economic-cultural: Population, economic situation, housing, health and hygiene, education, sanitation and basic facilities.

Human health has long been known to depend on an interplay of heredity and environmental factors. By the advance in Science and Technology, we have been able to overcome, to some extent, the infectious diseases which are due to the biological

component of environment. But other chronic degenerative diseases such as cancer, and others due to defective growth and development have emerged as foremost killers of humanity. These are no longer considered to be entirely due to heredity or inevitable accompaniment of ageing. Instead they are attributed increasingly to particular dietary and social habits, life style and other risks, of environmental origin. Many of these factors that affect the human body and mind are produced or controlled by humans themselves. They include physical and chemical agents in the air, water, food, drugs, cosmetics, consumer products in the house, in the work place and in the environment at large. 'The Environment' thus comprises innumerable risks in untold combinations. Furthermore, because these environmental factors interact in complex ways, the ultimate impact of any one factor may depend on others that are present and the conditions under which they are encountered.

It is not possible to deal with all medical problems of environmental origin in the limited space of this paper and hence *diseases attributed to major environmental degradation states – occupational hazards* have been avoided. Not only are they more specific in nature but also they require extensive space for discussion.

Prevalence

The clinical discipline of Environmental medicines, largely unstudied, untaught and unpractised in most places of the world, as recently as a decade ago, underwent unprecedented rejuvenation in 1980's, as a result of increased awareness and occurrence of environmentally related diseases. In most cases, they manifest slowly and imperceptibly, but rarely we have catastrophic environmental events like the Bhopal Gas Tragedy, the Chernobyl Nuclear Accident and the Gulf War which have brought in sudden death and chronic diseases to thousands. World wide attention was drawn to these accidents, but though we seldom realise, many more *mini Bhopal, mini Chernobyl* ones are common in many developed and developing countries, causing many deaths and diseases. Density of pollution of air and water in all the metropolitan cities of India show a marked increase during the last one decade, as a result of increased automobiles, industrialisation and population and they have resulted in many environmentally related diseases.

In the State of Kerala, Vypeen and Punalur liquor accidents raised the conscience of the people and there was much hue and cry in the media and legislature. But we don't realise that hundreds of thousands of persons are affected by illicit liquor and even by genuine one (ethyl alcohol), many of whom succumb to alcohol related diseases. In the backwaters of Kuttanad, the hospital records have established a steady increase in gastrointestinal diseases due to intake of water which has been contaminated and polluted by stagnation and excessive use of fertilizers, pesticides and fungicides. This was reported by our eminent scientist Dr. M.S. Swaminathan.

A study of the mortality statistics of Kerala highlights an increase in accidents (which is also environmentally related) and environmental diseases. High incidence of respiratory diseases like Asthma and Bronchitis around the industrial belt of Alwaye, also speaks of the adverse impact on the health of human beings owing to pollution by industries. In the different parts of India, increased incidence of certain infectious diseases like Malaria, Viral Encephalitis and Weil's Syndrome, have been reported and they have been attributed to environmental changes. Can we not attribute the emergence and spread of AIDS too to the impact of certain socio-cultural factors — also of environmental nature?

Classification

Environmental medicine, because of its current importance, has occupied a good section of medicine text books, yet no satisfactory classification of diseases is available. Environmental problems have been classified differently. One attempt has been to group them together according to their situation, namely, global (Green House effect, Ozone defect etc), regional (Acid Rain, Ocean Pollution), national (Deforestation in India, Desertification in Sub Sahara Region), local (Pollution of air, water and soil due to industrial activity) and individual (moral degeneration). For consideration of diseases related to environmental changes, the following classification appears to be satisfactory.

Green House Effect

Ozone Depletion

Deforestation, Desertification, Soil-erosion

Pollution of Air, Water, Soil, Sound by Toxic Waste-Disposal

Acid Precipitation and/Rain

Depletion of Ground Water, Biological Diversity, Ocean Bed Resources, Non-Renewable Resources.

Energy Crisis

Biological Weapon Research and Nuclear Arms Race

I am not attempting to go into the details of these environmental degeneration states, but shall confine myself to their health hazards. Adverse health effects can also be grouped into: - i) Predictable or speculative; ii) Possible and potential; iii) Proved.

I. Green House effect

The term 'Green House' effect refers to the rise of earth's surface temperature (global warming) owing to the accumulation of carbon dioxide and other gases in the atmosphere. Carbon dioxide is our society's single largest waste product — the estimated world production in 1988 came to 5 billion metric tons.

Consequences for health of the global warming are potentially great but are currently speculative. Apart from the increase in tiredness felt during warm weather known as Tropical Asthenia, owing to excessive sweating, people have lower resistance to common stresses of life. This will chiefly affect elderly people whose number is increasing rapidly, chronically ill and debilitated persons and perhaps infants. The magnitude of the increase in mortality is not yet clear. Air conditioning could reduce the number of sufferers, but it expends much energy and increases consumption of fossil fuels that create green house warming. The increase in mortality may also be offset to some extent by the decreased number of deaths from hypothermia and cold.

It has been predicted that with global warming, respiratory irritants in the atmosphere will further pollute the air, causing increased morbidity and mortality from lung diseases such as bronchitis, bronchiectasis, asthma and chronic obstructive lung disease.

II. Ozone effect

Only in the past few years have scientists understood that the gases liberated in the industrial processes (like Chloro fluoro-carbon, sulphur dioxide, nitrous oxide) reduce the ozone layer in the *stratosphere*, which forms a shield, protecting humans and other living beings from the damaging effect of ultraviolet (UV) Radiation. UV light is the portion of the electromagnetic spectrum between 200 to 400nm which is artificially divided into

subregions of A, B and C. UV-C includes wave lengths from 200nm to 290nm and is the most damaging to life, but ozone effectively blocks it from reaching the earth surface. UV-B includes solar radiation of wavelengths from 290nm to 320nm which is many times more effective in inducing Erythema (redness of skin) than UV-A whose wave length is between 320nm and 400nm. DNA (deoxyribonucleic acid) and aromatic amino acids in human cells absorb maximal amounts of UV-C, substantial amounts of UV-B and minimal amounts of UV-A. The diseases produced by UV are chiefly attributable to disruption of DNA and protein. UV-B also has been found to influence the immune system (composed of lymph nodes and B and T Lymphocytes) which is an important feature in the defence of the body against any noxious agent. Breakdown or weakness of the immune system makes a person more susceptible to many infectious diseases and cancer.

Though UV Radiation cannot penetrate deeply into the human tissue, critical organs for UV exposure are the eyes and the skin. The cornea, which is relatively opaque to UV light, and the lens of the eye are particularly liable to UV damage. Acute exposure to UV rays can give rise to painful 'photokeratitis and conjunctivitis', 'Welders Flash' due to rays from welders arc light and 'snow blindness' from sunlight reflected from the snow are examples of acute exposure damage. Prolonged and chronic exposure can damage the cornea and cataract of the lens. It is feared that too much prevalence of it in old age, and higher incidence in younger age groups may be the effects of ozone defect.

The common sunburn consisting of erythema, oedema, thickening and pigmentation of skin is a well known dermatologic sequel of acute exposure to solar UV radiation. In chronic prolonged exposure, basal cell carcinoma and squamous cell carcinoma ('Skin Cancer') have been found and they are observed to be on the increase. Another potential problem is melanoma-another type of skin cancer, which tends to increase under the influence of UV Radiation especially among the White.

As mentioned earlier, breakdown of the immune system is the most dreaded sequela of UV radiation and this can lead to increase in infectious diseases and also certain types of cancer in which the immune system plays a vital role as in lymphoma. Depression of immune system becomes more important when people are overcrowded, underfed, and are living under most

unsanitary conditions – a common observation in developing countries.

III. Climatic changes–deforestation, desertification, soil erosion

Combination of global environmental changes like Green-house effect, Ozone depletion, excessive unchecked human activities in the name of development and exploding population are believed to be responsible for climatic and adverse topographical changes affecting life on earth: The effects of these changes on the human race are both direct and indirect. Apart from the changes in the flora and fauna and adverse effects of biological diversity, food production too suffers. The main impact of these is socio-economic: There have been large scale migrations of people in Sub Sahara Regions including Ethiopia, many of whom succumbed to starvation and epidemics. Similarly, the tribals and villagers in the Narmada Valley Project area with the whole-hearted support and co-operation of well meaning and far-sighted people outside are agitating for their adequate rehabilitation as well as against the immense damage to ecology that would result from the execution of the Project.

Another problem consequent on these changes has been the emergence of certain infectious diseases, in different parts of India. They are believed to be due to water logging of the areas and changes in the salt content of water. Malaria is increasing in some parts and certain types of Arthropod-born encephalitis are reported from some parts of India and they have been attributed to changes in the forest-cover of the locality. Weil's syndrome (a bacterial disease affecting liver, kidney and brain) has been observed in increasing numbers in certain pockets in Kerala (Kottayam and Kozhikode districts) and Tamil Nadu. Stagnation and desalination of water have been incriminated for the increase.

Changes in microflora and microfauna in these affected areas cannot be discredited. The recently noted fish disease (Elizootic Ulcerative Syndrome) in Kuttanad backwaters is another glaring example. Fish there started dying in large numbers and the calamity appears to have made authorities aware and alive to the problem of stagnation and desalination of the backwaters of these places. It is at present viewed as a socio-economic problem and it will definitely prove to be a health hazard with political overtones.

IV. Hazardous toxic waste and pollution of air, water and soil

Hazardous toxic waste is a matter of great concern as they are responsible for major environmental problems. Main sources are:

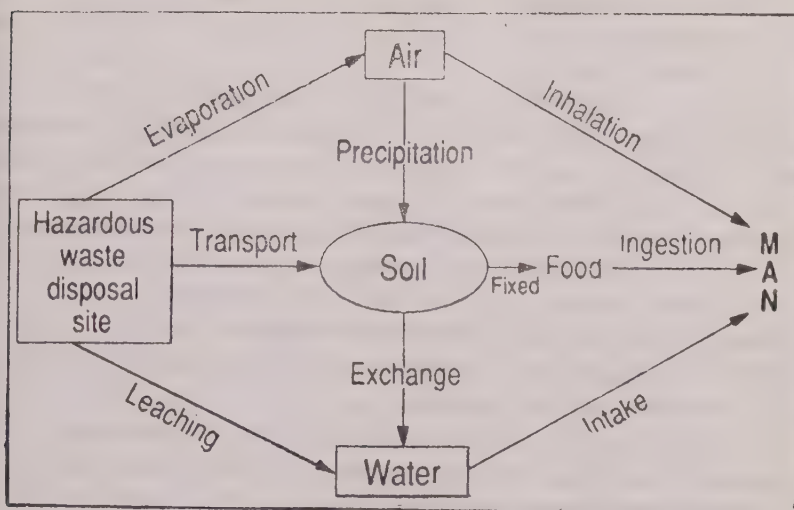
1. Burning of fossil fuels for energy
2. Industrial activity
3. Microbe, plants and animals, agricultural activities
4. Geochemical activities

One of the main sources of pollution and toxic waste is the burning of fossil fuels such as coal and oil, which are mainly used in stationary power stations and mobile automobiles. Carbon dioxide, sulphur dioxide and nitrogen oxide, the chief causes of acid rain and smog, and other toxic gases like methane and hydrogen sulphide are produced by burning of fossil fuels. Automobiles using oil release lead to the atmosphere contained in petrol. All developed countries are trying to minimise the polluting effect of fossil fuels by removing sulphur and lead from oil and by incorporating catalytic oxidants in automobile engines which lower nitrogen oxide exhaust.

Industrial activity is yet another source of pollution. The chemical toxic waste released into the environment during production, storage transport and disposal frequently interfere with or disturb the cycles and reactions of natural systems in the environment. Pollution of our big rivers like Ganga is a classic example. Besides, agricultural activity is also responsible for pollution of soil, water and air owing to the indiscriminate use of fertilizers and pesticides. Compared to the pollution from all these sources, that from geo-chemical activities like volcanic eruption, is relatively insignificant.

Toxic and hazardous substances enter the human body in different ways, through inhalation, ingestion or contact with skin (see Chart 1.) Exposure to them can be voluntary, as in the case of tobacco, alcohol and drugs, or involuntary: catastrophic (eg. Bhopal gas tragedy) or gradual (eg. Love Canal accident in U. S.). These toxic substances which enter the body by different ways affect different systems and functions of the body, producing a wide spectrum of diseases. We may discuss some of them.

Exposure from hazardous waste through environment. (Chart 1)



A. Respiratory diseases

Respiratory system is most commonly assaulted by environmental pollution as we breathe each day 10,000 to 20,000 litres of air or approximately 35 pounds of air which contain myriad, gaseous, particulate and fibrous pollutants. In spite of the chronic exposure to the pollutants, respiratory system is not much affected as it is endowed with efficient defense mechanisms. Occasionally accidental inhalation of toxic substances overcomes the defenses.

When considering the inhalation injury, it is useful to divide the respiratory tract into 3 regions. (see Chart 2)

Pathophysiological Responses of Respiratory Tract to Environmental Particles and Gases (Chart 2)

Site	Agent	Response	Comments
Nose	Pollen	Hay fever, rhinitis	Immunologic/non-immunologic mechanisms
Airways	Formaldehyde	Nasal cancer	Not conclusively established
	Sulfur dioxide, nitrogen dioxide	Bronchoconstriction	Reflex, irritant
	Aeroallergens	Asthma	Immunologic reaction
	Formaldehyde, wood smoke	Irritation, cough	Immunologic/non-immunologic mechanisms
	Radon, asbestos	Cancer	Relation of environmental asbestos exposure and lung cancer uncertain
Parenchyma	Thermophilic actinomycetes, fungi	Hypersensitivity pneumonitis	Immunologic mechanisms
	Inorganic dusts	Pneumoconiosis	Unrelated to environmental exposures

- i) Nose and extrathoracic passages upto glottis (throat)
- ii) Conducting airways including the trachea and bronchi upto terminal ones.
- iii) Pulmonary parenchyma where gas exchange takes place

Acute exposure The most notorious industrial Bhopal accident of 1984, which resulted in the death of about 3000 people and crippled tens of thousands is a classic example of acute respiratory diseases, following exposure to poisonous gas, methyl isocyanate. In the year 1952, in England inhalation of poisonous smog resulted in the death of about 4000 people. In addition there are many instances of accidental exposure to poisonous gases.

Chronic exposure The response of the respiratory tract depend on the site where the pollutants act.

a) **Nose** Chronic irritation of the nose leads to inflammation of nose with discharge. This may lead to blocking of nose and mouth breathing. Hay fever resulting from pollen is a common problem. More commonly, exposure to road and domestic dust result in chronic nasal discharge.

b) **Disease of airways** Several airway responses can occur, and the commonest is broncho-constriction (narrowing of the airways) giving rise to Asthmatic attack. When secondary infection takes place the condition becomes chronic bronchitis. If neglected the condition can lead to very crippling disease known as chronic obstructive lung disease. Many persons who have survived Bhopal accident are affected by this disease. Before Clean Air Act 1953, most of the Industrial Centres in England had very high incidence of chronic respiratory tract disease. The problem of Asthma and Chronic Bronchitis is high in the industrial belt of Alwaye. During summer season, the incidence of Asthma is higher, owing to increase of dust from roads.

c) **Parenchymal disease** If particles are organic, they may induce sensitivity reaction in the lung parenchyma and the condition is known as Extrinsic allergic alveolitis. The common symptoms are cough and breathlessness and disease is progressive if not protected from the pollutants.

d) **Pneumoconiosis** Persons working in certain industries and in some mines have high risk of exposure to irritant particles and fibers and they tend to develop chronic respiratory diseases, unless protected. These diseases, are collectively referred to as

Pneumoconiosis. Most commonly damage is in the parenchyma and the symptoms are progressive breathlessness and loss of weight.

B. Cancer

Cancer is the most dreaded of the environmental diseases. It can be thought of as the normal growth, development and differentiation of the cells of the body, gone awry. The development of cancer in an individual depends on the interplay of a number of physical, chemical and viral Oncogenic and endogenous (host) susceptibility factors.

The spectrum of environmental carcinogens includes chemicals, radiation and viruses and each may be considered separately. Radiation has been considered under separate heading. (see Chart 3)

Established Causes of Cancer from Workplace Exposure (Chart 3)

Agent	Industries and Trades with Proved Excess Cancers	Primary Affected Site
Para-aminodiphenyl	Chemical manufacturing	Urinary bladder
Asbestos	Construction, asbestos mining and milling, production of friction products & cement	Pleura, peritoneum, bronchus
Arsenic	Copper mining and smelting	Skin, bronchus, liver
Alkylating agents (mechlorethamine hydrochloride and bis-chloromethyl- ether)	Chemical manufacturing	Bronchus
Benzene	Chemical & rubber manufacturing, petroleum refining	Bone marrow
Benzidine, beta-naphthylamine and derived dyes	Dye and textile production	Urinary bladder
Chromium & chromates	Tanning, pigment making	Nasal sinus, bronchus
Ionizing radiation		
Gamma rays	Nuclear, health care	Skin, thyroid, bronchus, bone marrow
Radon	Uranium & hematite mining	Bronchus
Radium	Watch painting	Bone
Nickel	Nickel refining	Nasal sinus, bronchus
Polynuclear aromatic hydrocarbons (from coke, coal tar, shale, mineral oils & creosote)	Steel making, roofing, chimney cleaning	Skin, scrotum, bronchus
Vinyl chloride monomer	Chemical manufacturing	Liver
Wood dust	Cabinetmaking, carpentry	Nasal sinus

Many naturally occurring synthetic Carcinogens, ubiquitous in the environment, Alfa Toxin, Arsenic, Asbestos, Benzene, Benzu-din, Coal Tar, Pitch, Chromium compounds, D. D. T., are in the list and more and more substances are being identified to be carcinogenic. Persons working in industries dealing with these substances and persons staying near these industrial units or sites where hazardous waste of these units is dumped run the risk of exposure to these potential carcinogens.

Numerous potential dietary carcinogens have been identified. Alfa toxin found in food, have been linked with liver cancer. Many of the pesticides, herbicides and fungicides are also recognised to be carcinogenic and indiscriminate use of these substances can lead to increase in cancer. Tobacco smoking has been established to be carcinogenic not only in the lungs but also in other part of the body. Passive or involuntary or second hand smoking (environmental tobacco smoke) by non-smoker also carries the risk of cancer. Non-smokers married to smokers carry risk of cancer 3 times that of spouses of non-smokers. It is alleged that many of the additions in food like colouring agents, preservatives, fungicides are potentially carcinogenic. Cancer inducing viruses have been identified and AID is one of them. Instances of malignant diseases induced by viruses are on the increase, spread of such viruses can be influenced by socio-economic-cultural factors.

Related phenomenon is the influence of environmental factors on the development of foetus in Uterus and this is referred to as teratogenicity. Many drugs taken during pregnancy have been identified to be teratogenic and more and more are added to the list. Many toxic substances including some metals and chemicals in some industries, alcohol, tobacco smoke and drugs of addiction are notoriously teratogenic and they are more harmful when used in the early stages of gestation.

C. Health hazards of ionising radiation

Health hazards of ionising Radiation are often important news in the media and these have come into focus after the Chernobyl accident and with the raging controversy over the safety of nuclear plants. Man is subjected to different sources of radiation. They are Natural, Cosmic, Occupational, Medical, Accidental and Intentional.

1. *Natural*

All radiations apart from cosmic rays reaching the earth are produced by natural radionuclides. They are divided into two: series radionuclides – that decay through a series of nuclides to a stable isotope of lead, and non-series nuclides – that decay directly to a stable nuclide. The series nuclides are three — uranium, actinium and thorium. They are the principal sources of human exposure to radiation from earth into air and water. It is now recognized that radon emanating from these substances is a significant contributor to the dose incurred from background radiation. The contribution of cosmogenic radionuclides to the population dose is very small, despite the number of cosmogenic radionuclides produced in the atmosphere. The levels of these radionuclides increase with altitude, but the dose is a mere fraction of that received from charged particles.

2. *Cosmic*

The atmosphere absorbs not only ultraviolet radiation but also cosmic radiation. Cosmic radiation consists in galactic cosmic rays, intermittent solar particles that result mainly from the interaction of the galactic cosmic rays and atmosphere. The atmosphere is an effective shield reducing the cosmic radiation doses by perhaps three orders of magnitude.

3. *Occupational exposure*

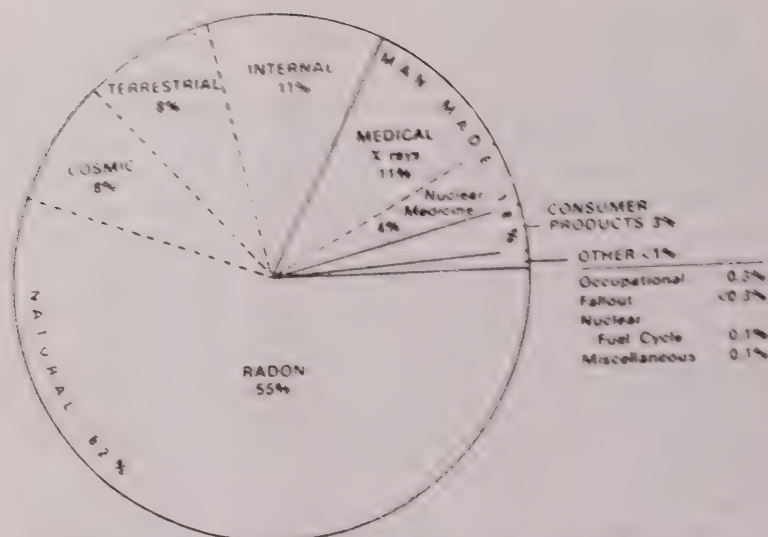
Those who are employed in nuclear power plants, medical radiology, industrial radiology and a number of activities that are mainly associated with research, are exposed to radiation. Here the protection is so secure that there is hardly any risk of over-exposure except in cases of careless handling or unsafe appliances.

4. *Accidental exposure*

Since 1944 there have been 305 world wide accidents that resulted in significant radiation exposure. Six of them were reactor accidents of which Chernobyl, Windscale and Three Mile Island have been notorious.

5. *Medical exposure*

More than 90% of the doses derived from man-made resources is from medical and diagnostic procedures. It has been estimated that 1% of all cases of leukaemia and 0.7% of all cases of breast cancer are caused by radiologic procedures. (see Chart 4)



Contribution of various radiation sources to the total average effective dose equivalent in the US population. The percentages shown are estimates, and the uncertainties of some estimates are on the order of at least two orders of magnitude. (From National Council on Radiation Protection and Measurements: Ionizing Radiation Exposure of the Population of the United States, NCRP Report No. 93, Bethesda, NCRP, 1987; with permission.)

a. *Biological effects of radiation:* Different types of ionising radiation have varying degrees of damaging influence on the cells and the most likely critical target structure in the cells, with the exception of some type of Lymphocytes (type of white blood corpuscles) and certain stages of the Oocytes is chromosomal DNA. Ionising radiation induces a wide variety of lesions in DNA. The lesion, considered most likely to lead to chromosomal aberration and death, is double-strand DNA breaks. In many cell types, the radiation-induced damage results in cell death only if the cell goes into mitosis, and in some cells such as lymphocytes and oocytes at certain stages of development, death occurs in interphase. Densely ionising radiation or high LET radiation such as neutron, alpha particles and heavy charged particles is more effective in the induction of chromosome aberrations and killing than sparsely ionising radiation such as X and R Rays.

b. *Clinical effects of radiation:* Two types of Reaction are seen as exposure to Radiation, early and late. Early acute effects occur

within the first few minutes up to 2-3 months following exposure to large amounts of radiation over a short period of time and are due to cell killing, impairment of cells' function, inflammation, and infection. The brunt of the effect is observed in haemopoietic (blood forming) organ, gastro intestinal and nervous system. Different types of disease states depending on the severity of the damage and system affected have been given in chart 5.

Clinical Effects of Acute (Single-Exposure) Whole-Body Irradiation (Chart 5)

Below 10 Gy		Above 10 Gy	
< 0.5 Gy	No symptoms	10-20 Gy	Gastrointestinal syndrome fatal within 1-2 weeks of exposure
> 1.0 Gy	Anorexia, nausea within 48 hours	50-100 Gy	Cardiovascular and central nervous syndrome fatal within hours of exposure
~ 2.0 Gy	Vomiting in 50% of cases within 48 hours	< 100 Gy	Immediately fatal
~ 3.25 Gy	Bone marrow depression, fatal in 50% of untreated cases within 3-4 weeks. Survival probable with appropriate treatment		
~ 6.0-8.0 Gy	Bone marrow depression, fatal in untreated cases within 3-4 weeks. Survival possible with optimal treatment		

c. Late effects of radiation exposure

i) *Leukaemogenesis (Blood cancer)*: Over a period of around 3-10 years after acute radiation exposure there is increased risk of the development of leukaemia, predominantly acute myeloid leukaemia. Other types of leukaemia are less likely to be increased by radiation exposure.

ii) *Carcinogenesis (cancer)*: Solid tumours are also induced by ionizing radiation exposure, once again increasing in risk as a function of increasing dose, but over periods up to 40 and more years after radiation exposure. The commonest sites of radiation-induced tumours are related to the sites in which cancer is most prevalent in the general population. There is inevitably a high incidence of skin cancer; increased incidence of other cancers of lung, breast, bone and lymphomas following radiation exposures,

has been demonstrated. For the establishment of permissible population and occupational exposure limits it is assumed that there is no threshold radiation dose below which no harm is caused, and the risk of inducing malignancy is assumed to be proportional to accumulated radiation dose. Animal and human studies suggest, however, that as the radiation dose increases there is a departure from this inexorable increase in induced malignancy due to killing by the additional radiation of the transformed cells which presumably would have evolved into a malignant clone. As a guide on best human data, it is suggested that total body exposure of 100Gy (1 rad) gives at most a 1 in 6000 risk of the development of fatal malignant disease in a particular individual. Thus, uniform exposure of a population of 1 million people to 100Gy may result in the eventual development of about 165 fatal cancers against a background of 200 000-250 000 spontaneous cancer deaths (Denton and McLean 1981).

(i) *Radiation damage to foetus*. Damage to fetus by ionizing radiation is a special case of somatic damage. The developing fetus is particularly susceptible to it during the period of organogenesis when the loss of reproductive capacity of a cell nest destined to evolve into a particular organ may be catastrophic. In particular, irradiation of the fetus during the period 8-15 weeks after conception during the period of development of the forebrain may lead to severe mental retardation (Otake and Schull 1984). The fetus, like the adult, is also subject to an increased risk of the development of leukaemia and solid tumours which is related to the total accumulated radiation.

(iv) *Genetic damage*. Radiation can produce both dominant lethal events and recessive changes not evinced in the first generation. However, with increasing radiation dose, an increasing proportion of those cells in which such transformations have taken place are rendered reproductively inert and cannot pass on their genetic information. Hence somatic rather than genetic damages are the limiting factor in determining permissible radiation exposure to populations.

(v) *Sick building syndrome*. An unforeseen consequence of the fuel conservation measures that followed the oil shortage of the 1970's was the concentration of common pollutants in tight buildings served by closed systems of ventilation. In the late 1970's and 1980's outbreaks of illness characterized by intractable

upper respiratory symptoms, ill-defined central nervous system dysfunction, and low morale and productivity have occurred in countless offices.

With the increased frequency of reports, however, the evidence became overwhelming that environmental factors, including smoke, formaldehyde, oxides of nitrogen, micro-organisms, and climates were culpable sometimes singly but more often in concert.

vi) *Multiple chemical sensitivities*: The most puzzling clinical entity emerging in the 1980's is the syndrome of ostensible allergy or sensitivity to almost all organic and synthetic chemicals. Patients, typically previously healthy people, usually present during a sick-building outbreak, or in the aftermath of an accidental over-exposure to an established toxin (a solvent, irritant gas or pesticide, for example) report recurrent, intensified symptoms to progressively smaller amounts of the toxin, often mere traces of the original offender. Works up to now fail to reveal physiologic abnormalities to explain these sequelae, but generalization begins to occur, with a broader array of symptoms, almost invariably including symptoms of the central nervous system, in response to an expanding repertoire of chemical stimuli.

vii) *Diseases of immune system*: The immune system is a complex set of soluble protein, cellular and chemical components designed to protect the body against foreign antigens (i.e., infectious agents, toxic and tumour antigens). Immunotoxicology is the study of adverse effects of immune system resulting from occupational, inadvertent or therapeutic exposure to drugs, environmental chemicals and in some instances biologic materials and these substances are collectively referred to as 'Xenobiotics'. A large number of experimental data is available to prove the xenobiotic effect of many metals (lead, mercury, cadmium and nickel) and organic compounds (compounds used as heat stabilizers, biocides and industrial catalysts in the production of foam and rubber). Considerable attention has been given to the immunotoxic effects associated with inhaled pollutants. These include gases, ozone, nitrogen dioxide (NO_2) and sulphur dioxide all of which appear to alter host resistance of the respiratory system to infection and toxins. Suggestive evidence exists that these gases also cause systemic immunotoxic effects. In addition to these gases, a number of inhaled chemicals, or chemical mixtures have produced immunotoxic effect under experimental condition. They include tobacco

smokes, fuel emission vapour, arsenic, and methylisocyanates. Asbestososis and silicosis which induce occupational disease have adverse effect on the immune system. From experience, more and more of the commonly used substances like food preservatives, pesticides and disinfectants are found to be immunotoxic.

V. Occupational medicine

Discussion of Environmental medicine will not be complete without considering occupational diseases, which have markedly increased with Industrial Revolution. Given the breadth of the subject, we cannot discuss every important topic in occupational medicine. Commonest are the lung diseases of which Bronchial Asthma is the commonest. Asbestosis, Anthracosis, Silicosis, Byssinosis etc. are examples of lung diseases due to different dusts damaging lungs by diverse mechanisms. Renal disorders (due to lead and organic solvents), blood disorders (due to Benzene, metallic and organic solvents) neurologic disorders (due to organic solvents like n-hexane lead, arsenic, organophosphate compounds), gastrointestinal disorders (due to alcohol and organic solvents) reproductive and endocrine diseases (due to metal organic solvents) are instances of occupational diseases.

Noise pollution

Webster dictionary defines noise as a sound...that lacks agreeable musical quality or is intolerably loud, harsh or discordant. Nobel Laureate Robert Koch said "A day will come when we will have to fight noise as inexorably as plague or cholera". Dr Samuel Ross, ENT surgeon said 'you may forgive noise, but your body will never'. These quotations amply explain the adverse effects of increasing menace of noise. Important sources of noise pollution are:—

- 1) Industrial activities
- 2) Road and Air traffic
- 3) Loud speakers
- 4) Cassette players.

Even though noise is annoying and frustrating, it is acceptable. The ear is an amazingly flexible organ, but it is not designed to withstand the strain of modern living. Hearing deteriorates with old age, but it becomes worse in persons who are exposed for prolonged periods to loud noise. Sudden intense noise, sudden gun shot, sound or dynamite blast can damage the

ear instantly by tearing the tissue in the delicate inner ear. Sustained intense noise is more damaging to the ear. Prolonged barrage flattens the tiny hair cells in the inner ear that transmit sound to the nerves. As the hair wilts, persons often experience a fullness or pressure in the ear or buzzing or ringing known as tinnitus. Such symptoms subside and having regained the upright position, the ear gets some rest. But unrelenting noise assaults can cause hair cells to lose their resilience and die. They do not regenerate and the result is a gradual loss of hearing. Besides exposure to loud noise for prolonged periods, as in the case of noise producing industries, there have been higher incidences of psychiatric problems and high blood pressure.

Awareness

‘Prevention is better than cure.’ This dictum is applicable in all fields of medicine, but much more in Environmental Medicine and for prevention of environmental diseases the awareness of the acuteness of the crisis and education of the people are most necessary. It is gratifying to note that during the last four decades, the world has been alerted to the deteriorating environment and this is evidenced by increased activities at all levels – global, regional, national and local. At the global level, the United Nations has taken the lead by observing many days and weeks to remind the people about the fast degenerating state. Earth Day (April 22), Environment Day (June 5), Tobacco Day (May 1st) and Wild Life Conservation Week (October 2 to 9th) are held all over the world. Many important bodies like Commission for Environment and Development ‘UNCED’) are active under the auspices of the United Nations.

Greens Party originally formed in Germany has become important and influential in the political life of all European countries. President Bush has declared the importance of environmental protection. Pope John Paul II has named Francis de Assisi as the Saint of Ecology. Gro Harlem Brundtland, Chairman of the World Commission on Environment and development in 1972 at Stockholm, through her document titled “Our Common Future” had stirred all the nations and she was given Indira Gandhi Award for peace, disarmament and development -- 1987, for her meritorious work. The Theme of the World Health Organisation for 1990 was ‘Our Plant Our Health’. “Think globally and Act Locally.” There is now an increasing realisation that environmentally all the

nations of the world are inter-connected, inter-related and inter-dependent.

Government of India has recognised the importance of environmental problems and has created not only environment department but also a Minister incharge of it. The Universities and Colleges have introduced environmental subjects in the curriculum and have started courses related to environmental subjects for creating awareness among students, and Nature Clubs, Friends of Trees Society, Environmental Clubs and similar societies are functioning. During the last few years many such clubs and organisations have sprung up in different parts of the country (estimated to be about 400) to preserve the environment. Some environmental and antipollution acts have been passed and it is stated that many more may be enacted in the near future.

Implementation

For the successful implementation of the environment rules, the most important is political and personal will. In the name of development politicians are anxious to embark on many projects which are energy consuming and polluting. The pattern of our development has to be sustainable, which in real terms means that it has to be environmentally harmonious and economically efficient. It must lead to equity with social justice.

When we consider individual responsibility to fight environmental problem, two main factors are important, namely consumerism and selfishness. If we consume more of everything, we spend more energy and hence more pollution. Mahatma Gandhi's words are worth remembering: "Earth has provided enough for the needy and not for the greedy." Unless the individual person or nation eschew the attitude of selfishness, environmental problem will go on escalating, engulfing each and every one of us in misery and suffering.

Dr. Mathew Parakkal

Forests and Environmental Protection

Internationalization of environmental problems has been very rapid during the last few years. The need to protect the environment and the major role forests play in it were voiced from the very beginning of this century. The *Sierra Club* of California U. S. A., founded by John Muir, a popular writer and naturalist, as early as 1901 came up with a call for wilderness (for keeping natural vegetation free from any interference) and won popular support in due course against construction of Dams and submerging of forests.

In India importance of trees and forests was recognised as far back as Asoka's time. Many a literary work extolled forest and forest atmosphere. Puranic stories and legends have always been related to or connected with forest. Rishis chose their abode in forest and several temples were built in forest areas. Forest was of religious importance too and was considered *sanctum sanctorum*. But the importance of forest was lost sight of in course of time and hence the present crisis.

Our priorities have been different. We have been and are still bent on developing industries. "Industrialize or perish", so said Nehru, the builder of modern India. In the march towards progress through industries, we have to learn our lesson from developed Nations and see to it that precautions are taken against possible environmental damages. The technology for conservation and regeneration being not yet fully developed, we have to be even aggressive and play a significant part in the process of rebuilding the environment.

Role of forests

Forests play a vital role in maintaining the climate, soil and water supply over a region. Forest and Environment act

reciprocally. The ecology of a particular site or region or habitat is influenced by the type of vegetation it carries which in turn controls the environmental conditions. Thus vegetation has a major role in designing the environment. Realising this nature's truth, a wide campaign to grow more trees is now going on in all the world. The United Nations' Environmental Programme (UNEP) has initiated studies to determine the role of forests in maintaining the environment. The U.N. has already made appeals to all nations to arrest felling of trees and launched tree planting programmes with a view to make the earth greener. According to the studies conducted by UNEP, the proportion of carbon dioxide is increasing rapidly in the atmosphere with that of oxygen facing steep fall. This results in the atmosphere becoming warmer. If this phenomenon continues unchecked, within a period of fifty years, a condition will set in when life itself will be difficult on this planet. It is an alarming piece of information and, thanks to the U. N., the nations all over the world have started responding to the appeal and greening programmes are in progress.

Turning to nature for bettering environmental conditions

As stated earlier, the plant growth (vegetation) has close relations with environment. Plants during photo-synthesis, take in carbon dioxide and give out oxygen. It is estimated that one hectare of forest produces oxygen equal to the quantity required for about 250 people. Forests also play a vital role in conditioning weather. When the atmosphere is too hot, plants cool the air supplying water vapour through transpiration. When too cold, the metabolic processes in plants generate warmth and reduce the intensity of cold. Soil and water conservation, regularisation and distribution of rain fall, sustained supply of water to streams and rivers to keep them perennial, maintaining water table high, providing home for large varieties of wild life and catering to the needs of the population are other services rendered by forests. It follows that more and more forests have to be grown for reducing the atmospheric temperature which is dangerously increasing. Hitherto forest was considered only as a source of revenue to the exchequer by way of timber and other products. Even those in the administration are mostly in the dark as to the multifarious benefits derived from forests and the principles of forest management based on sound silvi culture. It is so because forestry

used to be taught only to the benefit of foresters. General education curriculum is of no help to people to develop interest in forestry. And no attempt was made in the past to make people forest-conscious. Even persons at the official level pass statements which only show their ignorance of scientific forestry and related topics. In Kerala it was the Silent Valley issue that sparked interest among the public in environmental problems. Seminars, discussions and media publicity attracted attention of many. Nature and Forestry clubs, social and non-official organisations like the Forestry Board and various other forums now provide occasions for inculcating in the minds of the people real interest in trees and forests. However it has been too late. Forests have suffered irreparable damages already. A "political will" is yet to generate.

In countries like the Philippines, Korea and China, considerable expansion of forest could be made with people's participation and strict legislation. The parties in power were really interested and hence the result. It is an example of political will. In China, through commune forests the area under forest is now double what it was fifty years ago. But sad to say when such herculean efforts were on in other countries, in India political pressure mounted to get more forests cleared. This attitude should go and "political will" be generated.

Past history

In ancient times, population being low, the requirement of land for habitation was limited. Hence large areas remained forests. When population increased, more land was needed and forests were cleared. Thereupon clearing of forests kept pace with increase in population. History tells us of vast forest areas where no forest exists now. Alexander the Great who invaded India in 326 B. C. is said to have built a fleet of not less than 2000 ships of different sizes with timber and sailed down the Jhelum river. Now there are no traces of forests in those areas. Similar examples are many. Even the present Rajasthan Desert was once a dense forest as revealed by excavations.

Efforts to control destruction of forests

It was by the middle of 19th century that rulers felt it necessary to exercise control in order to regulate felling of trees and preventing destruction of forests aimed mainly at ensuring

sustained revenue. Very little was known of the indirect benefits of forests during those days. In 1855 the first legislation on forest appeared in India. The first National Forest Policy was declared in 1894. Principles of scientific management and the importance of forest in the development of the nation were officially acknowledged. The various States under native Rulers also followed suit. In Travancore Forest Act was passed in 1867 after demarcating forests and reserving them under notifications in the Gazette. The policy declared was: "no more land would be assigned". The destruction of forests came to halt and the condition continued till independence.

It was during the British Regime that effective steps were taken to bring Forest administration under uniform pattern, giving priority to conservation and regeneration. A Forest Research Institute was started at Dehradun. Forest Colleges were also opened at Dehradun and Coimbatore for training Forest Officers. Now, each State has a Research Institute and schools to impart training to Foresters and Guards.

In independent India

After independence, conditions changed. Forests were found an easy prey to satisfy vested interests under political pressure. For anything forest was allotted setting aside technical objections. The outcome was loss of about 3000 sq. km of forest in Kerala alone, during the three decades immediately following independence.

National forest policy of India-1952

The first National Forest policy of independent India declared in 1952, laid down that one-third of the total land area should be forest-cover. But the actual position then was below 30%. In order to make up the deficit, it was suggested that planting trees on lands outside reserve forest could be encouraged. It was with this in view that the illustrious Sree K. M. Munshi, introduced *Vanamaholsava* to be observed during July every year commencing from 1952. Thereon *Vanamaholsava* remained but an official exercise; people's participation was very little. 'Farm Forestry' that followed brought wonderful results in some states. Gujarat and Tamilnadu are examples. In 1980 a massive tree planting programme under the name 'Social Forestry' was launched all over India, the idea being to encourage people to plant more

trees supplying seedlings free of cost. Creating awareness among people is also the object of this scheme. Forestry Clubs in educational Institutions are part of this scheme. Seminars, study tours, short term courses in forestry to social workers and members of local bodies (Panchayats), film shows etc. form part of the programme. It has given good results.

History of deforestation in Kerala

In the beginning of 19th century, about 75% of land area was under forest in Kerala. In the beginning of 20th century it was 50%. Increase in population and consequent need for more land under plough necessitated clearing forests. During first three decades of this century the percentage still fell and touched 35. This short fall continued and now the area under forest is below 24% only. The absence of a strong State Forest policy came in handy for the land hungry to gain possession of forest land through political influence. It will be interesting to know how 3000 sq. km could be deforested in three decades. During the Second World War there was dearth of food grains. Import was strenuous. So food production was indigenously planned. Fertile lands from forests were distributed among people on temporary lease to raise food crops. It was "Food Production" in Travancore and "Grow more Food" in Cochin. Before the expiry of the lease popular Governments came to power. A series of Commissions and Committees were constituted to study and report on what could be done in the case of these forest cultivators. But no decision could be made. People got time to make permanent improvements and stabilise their possessions. Encroachments also started. In the meantime allotment of land from forest was made to several categories like political sufferers, INA personnel, exservicemen, those evicted from road poramboku, project areas etc. Colonies under different labels also sprang up. All these created a general impression among the public that forests, once in possession, could be possessed without the fear of eviction. This promoted more and more encroachments.

Instances are not rare when forest suffered for the satisfaction of vested interests and for the gain of political ends. The colonisation programmes launched in 1950s were mainly for such purposes. To cite only one instance, a large scale colonisation programme was initiated in the High Ranges (Devicolum, Peermade

Hills) early 1950, letting in people from plains who were allotted 5 acres each. It was not to provide land to the needy and landless. The object of the scheme was to increase the Malayalee population above that of Tamilians who were workers in Tea and Cardamom Estates. It was directed by a politician turned revenue officer. The result was destruction of beautiful evergreen forests, the Cardamom Hill Reserve. This adversely affected the ecology of the area and cardamom estates failed to yield as it did in the past. Since there was no proper survey and demarcation prior to allotment people took possession of it and expanded their lots in due course. Fresh waves of people came to occupy more and more of forest lands. Thus all except pattah lands were brought under occupation. Being on top hill, soil erosion was very high and the lands became incapable of producing any agricultural crop. So people turned to Ganja cultivation. There are frequent reports regarding destruction of Ganja plantations by Excise and Narcotic parties. These areas — Cardamom Hill Reserve — are under dual control by Revenue and Forest Departments. The former is the owner of the land while it is the latter's duty to control and protect the forest cover. This unusual position went a long way in the destruction of forests and prevalence of Ganja cultivation. This dual control could be ended much earlier; but was purposely delayed and is still not considered.

These hill ranges abound with streams but clearing of forests has resulted in the drying up of many of them. Their perennial nature is lost and scarcity of water during non-rainy seasons and increase in temperature have been the outcome.

Another major source resulting in the destruction of forests, mainly ever-green type is Hydel and Irrigation projects. But for the restrictions imposed on forest clearance by the Central Government through Forest Conservancy Act 1980, more areas would have been lost to the great detriment of environment. Forests have been brought to concurrent list which has been a right step to preserve them.

The Rehabilitation Plantations (Rubber) of Punalur to provide employment for repatriates from Sri Lanka, extensive Rubber and other plantations under Plantation Corporation of Kerala and Oil Palm Plantations of Oil Palm India Ltd are all in reserve forest areas, cleared for the purpose.

Unique natural features of Kerala

Kerala is unique in its forest wealth and natural features and enjoys covetable position among Indian States with regard to both economic and aesthetic values. The configuration of the ground with undulating topography, two monsoons, altitude varying from sea level to 2652 metres above M. S. L., good soil, position between sea and mountains and above all the tropical climate, provide optimum conditions for large variety of fauna and flora. All important forest types are met with in the western Ghats on the eastern border. Most highly priced timber like Teak and Sandal wood thrive there. The long stretch of forests on the East gives rise to 44 rivers of which all except 3 run across the breadth of the state finally joining the Arabian sea. Rivers Kabbini, Bhavani and Pamba drains eastwards. This wonderful net-work of river system is responsible for the rich flora throughout the State, irrespective of plains or hills. In the past, say fifty years back, the entire state of Kerala gave a forest like appearance, there being a chain of small forests and woodlands scattered throughout in addition to the vast stretch of them on the eastern border. Small pocket reserves, known as *Kuttyvanams* left out at the time of settlement as not occupiable, and maintained as Reserve Forests, woodlands kept by Farmers for green manure, brush wood etc., called *kompukalas* and small plots kept for snake gods by orthodox Hindu families called *Sarpakavu* came under the scattered forests in the plains. Arable land scheme aimed at clearing one lakh acres of forest for distribution among the landless launched in 1970s, marked the end of kuttyvanams. *sarpakavus* also were cleared in the advanced life style. Woodlands ancillary to paddy fields were cleared when the Land Reforms was brought in. Thus the greenery in the plains was lost. The disappearance of kuttyvanams was in utter disadvantage of the Agricultural population who lost the source of water, green manure, fuel, agricultural utilities, fodder etc. The atmospheric climate became hotter, water became scarce and rainfall irregular.

Water and Air pollution by Industries in Kerala

Though Industries are few, all major rivers in the State are under dangerous threat of pollution caused by effluents drained from Industries. The pollution of Chaliyar river water by Mavoor Gwalior Rayons Factory and pollution of atmosphere over the

entire Walakot panchayat resulting in lung disorders of the local people has already attracted popular attention. Same is the case with some other rivers. Newsprint Factory at Vellur, Cement Factory at Pallom, Travancore Electro Chemicals at Chingavanam, Industries of Udyogamandal, Pamba Sugar Factory, Punalur Paper Mill etc. cause both water and air pollution at different levels. Air pollution can to a great extent be controlled effectively by planting trees. This, in the long run, will also reduce the intensity of water pollution by making the supply of water perennial and in improved quantum. Each tree acts as a reservoir.

Present state of forests in Kerala

According to official figures 9400 sq km is under Reserve Forests which is 24% of the total land area as against 33% as envisaged in the National Forest Policy. Even this figure is not beyond dispute as there have been encroachments of which proper accounts are not ready. The encroachments prior to 1-1-1977 are to be regularised and lands assigned. There will still be encroachments of which eviction may not be feasible. Taking all these into consideration area available in the form of reserve forest can be moderately assessed as 7400 sq km. Another 1300 sq km may be available from nationalised private forests. Thus the total will be something like 9000 sq km.

Wild Life Sanctuaries and National Parks occupy 2317 sq km. These are under forest protection, where no operation will be carried out. Another 1600 sq km is man-made forests or plantations of Teak, Eucalyptus etc. The balance of about 3483 hectares will be natural forest. The composition in terms of forest type:

1. Evergreen and semievergreen 38%
2. Moist acciduuous 44%
3. Dry acciduuous 3%
4. Man-made Forests (Plantations) 14%
5. Montane type at higher altitude .1%

Now that clear felling* in forests has been stopped since 1982 and there is restriction in clearing forest for non-forestry purposes, whatever forest is left can be preserved if only there is "political will". There is sufficient public awareness also. Taking

* The present State Government is bent on introducing it (Editor).

advantage of the present tempo, intensive propaganda and encouragement to tree planting should follow. It will be economical to plant trees on farm lands as timber is very highly priced and much in demand. It is more so with Teak which is an all purpose timber and can be grown with ease. Incidentally 1991 is declared as Teak year by Government to commemorate 150th year of Teak planting. Planting different species on private holdings creating a green canopy will go a long way in conditioning weather and providing life pleasant. Now that air pollution is at a steady increase on account of vehicles all over the country, planting trees will go a long way to reduce the evils of atmospheric pollution by gases, smoke and dust.

Industries will provide employment. There is pressing demand for establishing industries and our political leaders are bargaining with the Centre for it. But only few think of the environmental problems in advance. Before piloting any project, parallel studies on the influence on environment should be conducted and remedial measures designed and incorporated in the project itself and strictly implemented. Taking care of the environment is taking care of life on earth. Let us not forget the warning given by Mahatma Gandhi, "Industrialisation is going to be a curse to humanity".

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Chernobhata?

Health Hazards of Nuclear Exposure in India

This is a report of my first impressions as a doctor, of the situation existing around the Rawatbhata reactors. It is not, nor does it purport to be a report of a scientific survey, though I feel that there is a great need for such a survey to be conducted immediately.

First a little geography. Rawatbhata reactors is something of a misnomer. The reactors are situated on the lands of a village called Tamlao. Rawatbhata is where the colony of the workers working in the reactors is situated and is about 11 km from the plant site in a northeasterly direction.

During a cycle rally, I was on a motorcycle and therefore reached Tamlao before the rest. To escape from the heat I took shelter in a small roadside shop and began talking to the people there. Some children were playing in the front yard. At first sight they looked just like any other poor children of the region. But on closer observation I noticed that many of them seemed to have difficulty in movement. I called them over and examined them. Many of them had muscular weakness. Two had bone tumours. Just then I noticed that a shopkeeper across the road had a thyroid tumour and the shopkeeper next to him had a cyst on the cheek. An old man had a nearly two inch diameter cyst on the cheek.

I studied medicine in Calcutta. But even there I had never seen so many patients with tumours in a single day. On talking to these people in Tamlao I found that almost all the symptoms had appeared after five or more years of the reactor's commissioning.

The next day we were in Rawatbhata and heard that a child had been born recently with talipes (crooked legs) in a colony of cattle herders. We went to see him. While there his mother

told us that her next door neighbour had a six month old baby boy with the same defect. When we went there, the lady said, 'Oh, there is another seven month old girl just seven eight houses away who too was born with crooked legs. Nearby in another colony we saw a two year old boy with the same problem and another two year old who had been born without any toes on both his legs.

Later we went to see Jharjhani village. This village is about eight to nine kilometers from the plant site in a direction opposite to Rawatbhata colony. The villagers claimed that at least 25 days a month the winds blew towards them from the plant. There every one I met, and I met hundreds of people, complained of stomach pains. There was a girl born here without one ear and another two year old who did not have a hand since birth. Again there were a number of children with tumours. A very large number had polio. There were two orphan children both with large lumps in the abdomen. Many women and men complained of sterility.

On talking to shepherds I learnt that they have been seeing similar problems in their herds for a long time. One person told us, "You can go and check from Panchayat records that this village ten years ago had 5,000 goats and sheep but today there are hardly 500. I have had goats born with three legs by the dozen".

I have been studying about the health effects of radiation for the last few years. I knew beforehand that there could be various kinds of effects. Because of long term ingestion of radio-nuclides immune mechanisms would be disturbed and therefore I was mentally prepared to see increased incidence of different diseases, some cancers and genetic defects. But even in my worst nightmares I could never have imagined that I would see so many in so short a time in such a small population.

I talked to the authorities of the nuclear power plant. They said that the amount of radioactive releases from the plant were so small — just half of one percent of the natural background — that it was inconceivable that these diseases and deformities were due to radioactive discharges. They were inclined to blame air pollution and adulteration in cooking oils for the problem. However, enquiries revealed that there are no factories or industrial establishments of any kind other than the nuclear power plant and the

Department of Atomic Energy operated heavy water plant anywhere in the vicinity to cause air pollution.

From some workers I heard that there had also been a number of cases of cancers and birth defects amongst the plant workers and their children but I was not able to see their health records to confirm this.

The number of crippling deformities and handicapped people around Rawatbhata that I saw is certainly abnormally large. I doubt if radiation in low doses can cause this much damage. There have been no reports of such teratogenic effects in the vicinity of other operating nuclear plants anywhere else in the world. Although recently there have been some newspaper reports indicating increasing incidence of such effects around Chernobyl. Therefore, I suspect that the 'routine emissions' from Rawatbhata have been much larger than what is admitted by the authorities. Or else there have been accidents and 'leaks' during its seventeen year history that the authorities have managed to hide from the public. Whatever be the cause, it is imperative that there be an immediate scientific investigation of the entire area. Even if there are no baseline health data for comparison, and it is criminally negligent on the part of the atomic energy authorities to have polluted the environment without having first collected baseline data, they and the government should immediately do comparison studies with areas without nuclear contamination and publish their findings. It is also necessary for independent scientists to conduct their own investigation.

We are building new reactors in Gujarat, Karnataka, Tamilnadu, AP and other places in the country. Will the same scenes be repeated in all these places a few years after the reactors begin operation? Would we see effects first in small domestic animals like goats and sheep and would there be deformed babies before even one generation passes?

Every citizen of the country needs to become aware of this danger. Now! If we want to save our land from this hell which goes on generation after generation the time for action is before these plants begin operation. I urge doctors, scientists and social workers living in the vicinity of proposed plant sites to beware of this terrible danger. They should go to Rawatbhata and look for themselves and take to acting now so that a similar situation can be avoided in the future at other places

Towards a Biblical Eco-Theology

We are on the brink of a frightening ecological disaster that threatens the earth with destruction and death. Our earth is suffering from illness and decay caused by humanity's greedy exploitation of its environment and ecological transgressions. It is heading towards a tragic physical death which would eliminate all traces of human existence from our planet. Advance in science and technology, instead of emancipating us from the dread of cosmic forces, is endangering us more and more through environmental pollution, health hazards, energy crisis and nuclear obliteration. Along with the great benefits achieved by science and technology, a whole series of unexpected and dangerous side-effects are unleashed and now threaten the earth with destruction and death. In the words of Jacques Ellul: "Perhaps the new definition of the human being should be not 'the animal who creates itself', but 'the animal who self-destructs' "¹. Appearing slowly and not very conspicuously at first, we do not become conscious of the way the ecological crisis is threatening our very existence. But as ecologists warn us, it has assumed alarming magnitude today and is tolling the death-knell of humankind on our planet. The gravity of the problem is more acutely felt in the poor third world countries where the imminence of ecological threat is always increasingly linked to the perpetuation of the world-wide, cruel economic injustice².

But what is most striking in today's picture of eco-systemic crisis is the sense of spiritual inadequacy to meet the challenge posed by the ecological crisis. While Christianity with its "desacralization" or "secularization" process emancipated its converts from the dread of cosmic forces, it deprived them of their age-old

¹ J. Ellul, *The Meaning of the City* (Michigan, 1970)

² See G. Therukattil, "Ecological Crisis — A Moral Dilemma" in *Moral Theology Today: Trends and Issues* ed. Bosco Puthur (Alwaye, 1991) pp.129-30

practice of communing with nature. The cosmic piety and the sense of cosmic morality began to degenerate into a hostile or manichean attitude towards the environment. "The sacramental approach toward cosmic reality began to degenerate into an instrumental theory of nature."³ The agapeic idiom of biblical Christianity "which justifiably invests the Absolute with transcendental personhood, has been allowed, by contrast to diminish the world to a state of non-personal, cosmic forces meant merely to be mastered and moulded by man (often not by woman) to serve as a series of stepping stones to reach his Maker"⁴.

Eco-theologians today are unsparing in their criticism of traditional biblical theology. They have concluded that it has been ecologically bankrupt. With its anthropocentric bias and its admonition to "subdue the earth", it was largely responsible for the anti-ecological stance of conquest of Nature and submission of the whole of Creation to the level of mere "objects" to be plundered and exploited. While emphasizing the "dominion" over Nature, it forgot the "birds of the air and the lilies of the field". It neglected the overall Gospel picture of God taking care to clothe lilies in the field and to provide for birds in the sky. In addition to this, the eco-theologians accuse traditional theology of an exclusive concern with "the other world" and "other-worldly" salvation to the neglect of responsibility for this world and the human problems here and now.

Hence what we need today is a fundamental search for a new creative theological approach to respond to the challenge presented by the ecological threat. But any Christian ecological reflection must begin by looking to the Bible for the inspired light it casts on the problem. We need an adequate biblical theology of ecology. It is not easy to construct such an adequate biblical eco-theology, since the Bible first of all is not a unified sermon, but a whole library of works with various theologies dealing with various religious themes. Nevertheless, this difficulty should not be exaggerated. It is the task of theology to listen to the chorus of voices in dialogue and even in debate and to attempt to hear the message of God's word that has been conveyed to us in the Bible. The eco-catastrophe invites us to a re-reading of

3 A. Pieris, *Love Meets Wisdom: A Christian Experience of Buddhism* (NY, 1988) p. 15

4 Ibid.

the Bible. It invites us to, what eco-theologians call, an "ecological reading" of the Bible⁵. For so long we have been reading the Bible in an anthropocentric perspective and by so doing, neglected an important religious theme in the Bible, namely, God's love and concern for the entire cosmos and humans' co-creative stewardship for promoting the unity and integrity of the whole cosmos for a human life in harmony with Nature.

What was behind traditional theology's ecological bankruptcy and manichean attitude towards Creation? It was a series of interlocking and destructive dualisms that crept into theology when it started interpreting the Bible in the dualistic perspective of Greek philosophy. The basic conception of this dualism was the split between God and the material universe. As a result, God and the world are placed at opposite ontological poles. This vitiated the view of theology on Nature-human relationship from the organic to a mechanistic interpretation of the entire Universe. Owing to the prevalence of this mechanistic way of looking at the world as a whole, the mastering or conquering of Nature came more and more into focus⁶. Man's lordship over Nature as something "to rule" and "to subdue", as recorded in the priestly Creation story of *Genesis* 1:28, was largely responsible for this "theology of domination". The assumption was that it is humanity's God-given task to exploit the earth and its environment to meet any human needs and desires. This approach to Nature was greatly accountable for the generation of a blind technomania that is regardless of the environmental recklessness.

1. Critique of Theology of Domination

There is a plethora of biblical literature against the "theology of domination" approach today. Human dominion over Nature as "subduing", found in the priestly narrative of the Creation story, (Gen 1:28) was only one of the many streams of tradition⁷. But this one aspect got an excessive emphasis in the theology of creation in Western Christianity at the expense of the other

5 Cf. H. P. Santmire, *The Travail of Nature* (Philadelphia, 1985) pp. 189-218

6 C. Halkes, "The Rape of Mother Earth: Ecology and Patriarch" in *Concilium*, Vol. 206, n. 6, Dec. 1989, p. 91

7 Cung Choon Kim, "Toward A Christian Theology of Man in Nature" in *The Human and the Holy: Asian Perspectives in Christian Theology* eds, E. P. Nacpil & Douglas J. Elwood (New York, 1978) p. 111

important elements in the other biblical writings owing to the false dichotomic view of Greek philosophy in the light of which it was interpreted and formulated. This led to the ruthless and arrogant exploitative attitude of the westerners towards Nature.

However, a close study of even this priestly narrative shows that the expression "imago Dei" found in Genesis 1:26-28 is used to express human's proximity to God and determines precisely the leadership role given to him⁸. Human being is placed in Nature as God's representative to rule over the rest of Creation. Commenting on the relation between humankind's creation in God's image and its responsibility to "have dominion" over all Creation (Gen 1:26-30), Gerhard Von Rad says: "This commission to rule is not considered as belonging to the definition of God's image, but it is its consequence, i.e., that for which man is capable because of it...just as powerful earthly kings, to indicate their claim to dominion, erect an image of themselves in the provinces of their empire where they do not personally appear, so man is placed upon earth in God's image as God's sovereign emblem. He is really only God's representative summoned to maintain and enforce God's claim to dominion over the earth"⁹. The total context of Genesis 1:26-30 shows that there is an implicit covenant which is explicitly made by God with Creation wherein the human being made in God's own image was to entrust the Creation to him to achieve the purpose of Creation¹⁰. "Precisely in this relationship between 'being in God's image' and 'having dominion over the Creation' do we grasp hold of a biblical understanding which may be here designated by the term "stewardship". The biblical synonyms for this concept are 'faithfulness', 'obedience', 'justice', 'love for God and one's neighbour'¹¹. Thus the criteria for human's accountability before God are: 1) potential to be God's representative, thus extending God's

8 D. P. Niles, "Biblical Viewpoints: Old Testament" in *The Human and The Holy*, Op. cit., p. 77

9 G. Von Rad, *Genesis: A Commentary*, trans. J. H. Marks (Philadelphia, 1961) pp. 57-58

10 M. D. Ambrose, "The Cosmic Experience of God According to Genesis" in *Indian Theological Studies* Vol. 26, n. 2, June 1989 p. 128

11 W. M. Swartley, "Biblical Sources of Stewardship" in *Earth is The Lord's* eds. M. E. Jegen & B. V. Manno (New York, 1978) p. 24

presence in the world and 2) the command to take delegated responsibility to God's Creation¹².

The context of *Genesis* 1:26-30 thus speaks of our responsibility for Creation. Exploitation of Nature would be an abuse of stewardship and would constitute a breach of the Covenant¹³. The essential message here is that God in creating human in His image, made him free and intelligent sharer in the governance and completion of His Creation, but this intelligent power over creation is not autonomous, it is a co-creative, responsible stewardship¹⁴. Thus the biblical perspective affirms that stewardship is not stewardship of one's own possessions but stewardship of what belongs to God. Stewardship is not a way of managing our possessions: It means rather that we care for what God has entrusted to us¹⁵. Therefore there is no basis in *Genesis* 1:26-30 for assuming that human's dominion is in the sense of exploiting Nature. His mission in the world is to complete Creation (*Gen* 1:28). This is a conclusion to the proposition stated in *Genesis* 1:26.

Besides, a better translation of the verse: "Be fruitful and multiply, and fill the earth and subdue it" (*Gen* 1:28) would be: "Fill the earth and possess it". There is no implication of brutal mastery or exploitation. Gerhard Von Rad considers that the term for human domination over the subhuman creation is remarkably strong, implying "tread", "trample", and "stamp"¹⁶. This has been taken to mean that Adam is to crush lesser creatures under his foot, but the image of stepping onto territory also symbolizes "taking possession" without any implication of destruction. This is more in keeping with the picture given in *Genesis Chapter II*, of human as the guardian and cultivator of the garden¹⁷. In fact *Genesis* pictures humans living in Eden at peace with animals both feeding only on plants (*Gen* 1:29). The "dominion" of human over animals (*Gen* 1:28) is that of guidance, like a shepherd to his sheep. Throughout the Torah there are numerous provisions concerning care of animals and of the land (*Deut.* 25:4; *Ex.* 23:10-13).

12 Ibid.

13 C. Westerman, *Genesis 1-11: Commentary*, (Minneapolis, 1984) p- 52

14 B. M. Ashley, *Theologies of the Body: Humanist and Christian* (Massachusetts: 1985) pp. 418-419

15 W. M. Swartley, *art. cit.*, p. 23

16 G. Von Rad, *Op. cit.*, p. 59

17 W. Brueggemann, *Genesis* (Atlanta, 1982) p. 32ff

Moreover, the repeated formula "And God saw it was good" (Gen. 1:31) affirms clearly that all life – human, plant or animal have their worth and are blessed by God¹⁸. Also, the Noahic covenant affirms the same. The scope of this covenant made with Noah as representative of the human race is universal. Every human bears the image of God (Gen 9:6) even after sin. The harmony of human and non-human creation is now lost. God has now to take into account the possibility of human reverting to his claim of independence and trying dominion over creatures mindless of his stewardship. Therefore the providential care referred to in Genesis 8:21-22 is now extended to all humans and creatures. The new covenant "proclaims God's universal lordship over the creation, his care and concern towards it"¹⁹. In this covenant too, we find a restriction put on human's exercise of freedom. He is to be a steward (Gen 9:4-6). He is given the responsibility of a steward. He is to respond to God in the name of creatures, since they cannot respond themselves²⁰.

II. Biblical Theology of Co-creative Stewardship

More than all these arguments, the Yahwist tradition of Creation story shows that the charge of the earth that God entrusted to humankind is one of responsible stewardship or trusteeship. Humans are told to "till the earth" and "care" or "keep" it, (Gen 2:15) with the responsibility of a gardener, who need to show great sensitivity to the resources available and the bounty²¹. Thus a closer look at the Priestly narrative and the Yahwist narrative, shows that the function of these two narratives is to exhort the human being to exercise trusteeship in relation to Nature and to society²². He has to "till" and develop the world and at the same time watch over it, "keep" and preserve it from exploitation²³. "The ethical responsibility of the human consists in continuing God's work of creation by continually transforming the earth, by tilling it and making it ever more livable one, livable

18 J. Reiter, "Environment and Ethics" in *Theological Digest*, Vol. 36 n. 3 Fall 1989, p. 228

19 J. Skinner, *Genesis* (Edinberg, 1976) p. 158

20 G. Von Rad, *Op. cit.*, pp. 131-133

21 Maureen Smith, "Ecology Crisis" in *The Cord*, Vol. 33, n. 2, Feb. '83 [p. 4]

22 K. Luke, "The Biblical Account of Creation-Terrestrial Realities" in *Jeevadhara*, March 1978, pp. 101-120

23 M. D. Ambrose, *art. cit.*, p. 132

not only for himself but also for the whole Nature"²⁴. Man has not the author's right to Nature, but only the duty of a steward who is expected to obey God's directions. He is subject to the will of God Who imposes limits upon his use and domination over things (Gen 2:16-17). And therefore when the human seizes and appropriates Nature, he becomes a bandit or a usurper. As long as he acts as a steward of God, harmony exists in Creation, but once he claims the prerogative reserved to God, as the story of the Fall shows, he is out of harmony with the rhythm of the created order. Nature is part of the covenant between God and Creation. Humans and animals are covenant partners with God (Gen. 9:9-11).

Moreover, the fact that the human was the first to be punished even though he was the last to be created meant that when Creation becomes perverted through him, he was the first to be called to task. This means that he cannot do as he pleased with Nature. He must take care of it in the way that God wished it. Besides his being last to be created and placed in the garden with all natural blessings shows that he is placed into radical connectedness with Nature. It shows that he is given identity through relations with God. He is made to be in solidarity with Nature. His createdness makes an ethical relationship of creaturely solidarity and care. Thus the Genesis view of man is creaturely solidarity and calls man to put in an effort for maintenance of the world in the service of God and in the direction of God's dream of love and justice²⁵.

Meditating on the other books of Old Testament, we find that the book of Deuteronomy speaks of land as a gracious gift given to humans (Deut 8:7-10). The Deuteronomist expands the Yahwist's idea of the Nature-human relationship based on the covenant relationship between God and Israel which requires certain duties as "keeping the commandments of the Lord by walking in his ways and fearing him" (Deut 8:6). Perusing through the book of Leviticus, the idea of giving rest to the land for a year as found in Leviticus 25:4-5 and the central idea of man's relationship to the land as found again in Leviticus 25:18-19,

24. Felix J. In 'Eco-Justice and Human Survival' in *Jeevadharma*, Jan. 1988, p. 71

25. R. Burggraave, 'Responsibility Precedes Freedom: In Search of A Biblical-Philosophical Foundation of A Personalistic Love Ethic' in *Personalist Morale*, ed. J. A. Sellings (Leuven, 1988) p. 122

affirm that: "the land belongs to me and you are only strangers and guests" (Lev 25:23)²⁶. The idea of stewardship catches this guest relationship that characterizes human-on-the-land entrusted with the wealth that belongs to God. The basis for the radical social legislation in Leviticus 25:1-12 was that the land is a gift from God. "God owns the land" is the fundamental conviction of the Old Testament. The account of creation makes it clear that God is the real owner. Because God created the world and all that is in it, he is the owner of everything. A number of passages in the Old Testament further strengthens this conviction (Ps 24:1, Job 41:11, 1 Chron 29:10-14). All this teaches that stewardship is not stewardship of one's own possessions but stewardship of what belongs to God. From this perspective we can understand the prophets' call to be just stewards of God by practising justice (Jer 7:5-7, Is 58:12). This also explains the great indignation of prophets over land grabbing (Mic 2:1-2, Is 5:8). Because God remains the owner, our poor neighbour's welfare can never be slighted, for God remains God of the poor and Father of us both (Mal 2:10). The absolute owner is God of the poor and He insists that the earth's resources be shared and therefore the prophets insist that the earth's resources must be shared among the poor. The Bible assumes not the "sanctity" of private property but its social responsibility.

Moving on to the New Testament perspective we find that the stewardship is taken from Jesus' parable of the unjust steward, *oikonomos* (Lk 16:1-8). The parable of the talents (Mt 25:14-39) or the pounds (Lk 19:11-28) makes it clear that the owner of the land puts severe demands on those to whom he entrusts his goods. Reflection on the idea of stewardship might prompt one to recall that Jesus used his parable of the talents to praise the outward-looking and dynamic stewardship and to blame the stingy and the static. God has given us his talents not merely that we preserve them, but we may invest them and return a profit to the owner. The biblical God requires us to use his gifts creatively. It is human responsibility to use God's gifts, our talents, and resources of the earth with creative freedom, with the wisdom that chooses the right means to the right goal, not with the foolishness of the prodigal son who wasted his heritage in riotous living without the

thought of the consequences to himself and to others (Lk 15:11-32). Responsible stewardship implies a respect for the sacredness of the order of creation, of the earth which was created to be our Eden. Jesus' argument in the parable is based on the assumption that our resources are not ours absolutely, but only held in trust. Included in our wealth of resources are not just the non-renewable ones but also human intellect and imagination. Christian stewardship calls for dedicated application of intellect and imagination on to human problems.

Such scriptural evidence supports the conjecture if not the precise conclusion that human is expected to interact with his environment responsibly, in fidelity to the trust bestowed on him by God. An ethic of responsible stewardship is needed to promote the symbiotic relationship with the eco-system. Every human must safely work at developing natural resources by setting up a symbiotic approach by working in collaboration with Nature so that a humanized eco-system is developed and maintained and people learn how to alter the earth profoundly without degrading it. The just use of resources respects and safeguards the interactions and balance between plants, animals, people and their environment. In practice, social justice and responsible stewardship demand that society and individuals expand their perspectives to include the common good, and the future good. Specifically, we exercise stewardship over the world's resources by a sharing, caring, sparing use of them. What is expected of stewards is that each one should be found worthy of his trust (1 Cor 4:2).

Thus though the word "stewardship" as it is used and misused today is not a biblical term, nevertheless there is a concept of stewardship that is everywhere present in biblical thought, a concept or view that regards mankind responsible before God for the use of the created world, the social health of the people, and the maximal development of each person's abilities for the up-building of the community²⁷.

III. Biblical Theology of Inter-Relationship

Even the theology of stewardship does not address the whole of the biblical message regarding Creation or the heart of the challenge posed by the global ecological crisis. Stewardship still implies a managerial relationship to Nature. And very often

the full and rich biblical meaning of the human as steward has been distorted by the dominant anthropocentric view of traditional biblical theology.

A deeper reading of the Bible shows that there is in it a solid and wholesome sacramental approach to Creation which does more than urge good stewardship and affirms the intrinsic value, goodness and worth of Creation. Such an approach shows that our understanding should move beyond the advice to use earth's resources wisely. This approach in the Bible can be called a "theology of inter-relationship"²⁸.

If we read deeply the Creation story of Genesis, it teaches an intrinsic relationship between humankind and Nature. It stresses that man, Adam, was created from the ground, *adamah*. Adam is made from the *adamah* (Gen 2:7). God created Adam out of the earth; respect for the earth is respect for Adam. When Adam sinned, the ground (*adamah*) was cursed (Gen 3:16). The Old Testament prophets adopted this approach, when they preached this theology of inter-relationship (Hos 4:1-3). God is suing people for breaking the terms of the covenant and therefore "the land mourns". Barrenness of the land results from people's immorality. Ecological welfare is made dependent upon people's moral and spiritual condition. The same type of sermon recurs in *Isiah* 24:4-5, *Jeremiah* 4:18-28, and *Micah* 6:1-15. On the basis of these insights into the pattern of biblical thought, it is clear that the life of humankind is inextricably related to the ground of its origin, welfare and destiny. God's grace is present in the world. *Genesis Chapter 9* promises that Creation can be trusted. Wisdom literature of the Bible invites humanity to discover the inter-relationship, harmony, wisdom, and grace given by God within the Creation and then to live accordingly (Wis 1:7; 7:15-22; 8:6). The whole book of *Ecclesiastes* speaks of the need for respecting the law of nature for a life of harmony. It admonishes man to live in harmony, to live in symbiosis with nature (Eccles 3:1-9, 19; 8:6 11:3-7). The last chapters of the Book of *Job* (Chs. 38-41) speak of *cosmotheandric* approach to creation. Everything in Creation is not for human's usefulness, but for God's glory (Job 39:5-12, 19-25). Everything that exists in the natural world is

28 W. Granberg-Michaelson, "Renewing the whole Creation" in *Verbum SVD* Vol. 32, 1991, p. 48

not meant to be domesticated by human beings and subjected to their service but for God to take delight in (Job 38:16-20). Utility is not the primary reason for God's action. Job is invited to sing with Yahweh the wonders of Creation. In these last chapters of the book of Job God is described as the gracious protector of Nature and rejoices in his Creation. "The Lord by wisdom founded the earth, by understanding he established the heavens" (Prov 3:19-20).

Isiah 11:6-9 is a beautiful description of the eschatological hope – inter-relationship and harmony between humans and Creation. The prophetic vision recognizes that there must be human interaction of peace with Nature. Thus the whole Old Testament image of salvation implies a healing and wholeness that encompasses relationships with God, between people and with the land. Disobedience against God yields unfruitfulness at the harvest time.

The theology of inter-relationship takes a cosmotheandric view rather than an anthropocentric view. Creation has an inherent value because of its relationship to God rather than its utility for humanity. It is created and sustained by God, and is for giving glory to God. The God who creates it and sustains it continues to act in it. The Creation is God's way of meeting man to bestow His blessings on him. The book of Creation is as important as Sacred Scriptures, because it is a sacrament of God and presents an image, symbol and word of God, since each creature is His personal handiwork, "the work of thy fingers" (Ps 19:1-6; Ps 8:3). The harmonious melody of the cosmic symphony is an eloquent invitation to be open to the mystery and awe of Creation. But it is only the upright and righteous who can "read the Creation" and live accordingly (Ps 33:1-9). "The earth is the Lord's" (Ps 24:1) and therefore calls for a profound theological respect²⁹. To destroy the earth is to disgrace its Maker and Owner. " 'Mother earth' touches the chord of gratitude in human beings and makes them sing the *Hymns of Creation* as presented in the Psalter."³⁰

29 S. Rayan, "The Earth is the Lord's" in *Vidyajyoti Journal of Theological Reflection*, Vol. 54, n. 3, March 1990, p. 122

30 R. J. Raja, "Eco-spirituality in the Psalms" in *Vidyajyoti Journal of Theological Reflection* vol. 53, n. 12, Dec. 1989, p. 639, The following psalms are considered as Hymns of Creation: Pss. 8, 19, 33, 95, 100, 103, 104, 136, 145, 147, 148

In the Psalms we find a deep concern with Nature, whose "owner", "protector", "giver" is God (Ps 24:1; 33:6-9; 36:6; 50:10-11; 65:6-14; 89:12; 95:4-5; 145:15-16; 147:4-5, 8-9, 15-18). Hence respectful concern for what God loves into existence. In Psalm 104 a theology of inter-relationship is clearly expressed in the ecological doxology. The author of this psalm depicts the order, symmetry and majesty of created realities (Ps 104:1-5, 10-23). He tries to reflect on Nature, whose mission, he says is to glorify the Creator, the preserver of life (vv 27-30). The various other psalms also have the same theme (Ps 65:7-14; 66:4; 100; 119: 91; 148:7-13). The second book of Isaiah also has a similar theme (Is 40:12; 42:10-13; 43:16-19; 44:23).

Coming to the New Testament, in the synoptic Gospels, Jesus' words and deeds exalt Nature. In the Sermon on the Mount (Mt 6:15-34) Jesus says that God crowns the earth with splendour far more than that of Solomon. He praises the beauty of the lilies of the field and the care-free life of the birds of the air and says that God's providence extends to them too, even if we are of more value; thereby implying that we are to live in harmony with Nature, not to exploit it. Jesus invites humanity to learn from Creation, the birds of the air, the lilies of the field and trust in the divine providence. Jesus says that we have to be salt of the earth and light of the world (Mt 5:13-15). He spends forty days of prayer and fasting in the desert and lives in the company of wild beasts (Mt 4:1-2). A number of parables employ natural symbolisms. "In short, the common world is pictured as a place of transforming presence"³¹. In Jesus' parables we find an active relationship between human and nature which is often depicted as the medium for reaching the message of the Kingdom of God to humans.

John's theology of the incarnation of God in Jesus Christ should not be understood only in terms of divine-human encounter but also nature as an integral element of incarnation. Incarnation affirms the world in affirming the human. Christology of John's Gospel lifts creation theology to an entirely new level (Jn 12:32) portraying Jesus as the great reconciler between heaven and earth drawing all things to himself³².

31 Plieme Perkins, *Hearing the Parables of Jesus*, (New Jersey, 1981) p. 89

32 Donald Senior, "The Gospels and the Earth" in *Bible Today*, vol. 26, n.3, 1988, p. 145

The Pauline theology of the cosmos groaning for a new creation (Rom 8:21-23; Eph 1:10; Col 1:15-17,20) speaks of the whole Creation's (not just humans') rightful hope of deliverance, when God may be everything to everyone (1 Cor 15:28). What really seems to be envisioned here is a restoration of the entire universe to a state of goodness that God originally intended for it. We are the 'sons and daughters of God' responsible for the "new Creation" of the universe which is being built up day by day into the Kingdom of God³³. Pauline theology also speaks of the cosmic Christ. The whole cosmos is destined 'to be the body of Christ through our communion with it. Thus in Paul we find the theology of creation properly reconstructed — a "whole" Creation groaning in travail together. Creation is good because it was conceived in Christ, it is Christic, filled with divine presence and forms a divine milieu and is an ongoing process in which God is intimately and continuously involved.

In the book of Revelation the physical world is the arena and context for human salvation³⁴. It also awaits for the fulfilment in the parousia of "a new heaven and new earth" with Jesus Christ who makes all things anew (Rev 21:5). Also, we must not forget the role of the Holy Spirit in a full understanding of God's relationship to Creation. In many passages of the Bible the Spirit is linked to the renewal of Creation. The Holy Spirit is depicted as the agent in Creation (Gen 1:2; 2:7; 6:17; 7:15; Ps 33:6 139:7; Ezek 37:1-10; Job 33:4). The Spirit comes to enable us to re-create our earth (Wis 1:7; 12:1; Ps 104:30; Is 65:17; 66:22ff; Jer 37:1-14). The Holy Spirit renews the whole Creation. The universe carries in its every expression the stamp of the living Spirit.

Even though New Testament is concerned with the in-breaking of the Kingdom of God and deals primarily with the tension between the "old" and "new" order, here too God's revelation is with the "whole" of Creation which "awaits with eager longing for its redemption and transformation"³⁵. God's work of redemption

33 Bede Griffiths, "Nature, Technology and the New Society" in *Jeevadhara*, Jan 1988, p. 26

34 A. Y. Collins, "The Physical World in the Book of Revelation" in *Bible Today*, Vol. 26, n. 3, May 1988, p. 158

35 Ben Dominguez, "Biblical Viewpoints: New Testament" in *The Human and The Holy*, Op. cit., p. 82

in Jesus Christ encompasses the whole of Creation and provides the grounds for restoring the brokenness in the relationship of humanity to creation and both to God. We are rooted in the faith that this creation, though wounded by sin, is in fact becoming God's new creation through Jesus Christ. God's intention and purpose for the creation becomes focussed in Jesus Christ. Through his life, death and resurrection, the 'new Creation' breaks into this world. New Testament declares that all things were created through Christ and are reconciled in Christ. Thus to be a Christian means to be in Christ and to be willing to participate in Christ's ongoing work of cosmic redemption.

IV. Towards an Adequate Eco-Theology

A biblical theology of inter-relationship would affirm that our first impulse should be to trust and co-operate with Creation rather than remake it. We would co-operate with Creation by studying the intricate inter-relationships, biospheric culture and community in the created world and by setting up a symbiotic relationship with the eco-system. When an intervention is to be had, it must be thoughtful and judicious based on respect for the natural order provided by God, not for human's selfish exploitation but in order to husband it for its own well-being and for the qualitative humanization of humans. Contemporary theology needs such an organic and mutualistic way of understanding the world, a model by which we can see that all that exists is inter-related and has an intrinsic worth and value. We need such an appropriate language in theology: understanding God-world and human-world relationships as coen, caring, inclusive, interdependent, changing, mutual and creative.³⁶

Our dominant world view is today taken through the lens of the enlightenment and the scientific and industrial technomania. A Christian commitment to God's creation must challenge the dominant attitude of moderns in thinking about the world and offer a new vision for societies, rooted in God's ongoing activity as Creator, Redeemer and Sustainer.³⁷ Our past pictures about God's relationship to the Creation have been more influenced by the secularisation of the world, than by the imagery of the Bible or the creativity of God. We are wont to think of God as above

36. S. Ruffaque, *Models of God* (London, 1981), p. 14.

37. W. Granberg-Michaelson, *etc. cit.*, p. 59.

and outside Nature. We see the world and its goods as being altogether outside the context of our relationship with God. God is seen as a clock-maker who having invented it and started it ticking, left it for good. In our day we have lost that sense of God as Father ever present in the creative development of the world for the good of all and everything. The biblical pictures and models that convey the theological truth of God as Creator, the dramatic images of the incarnation and the metaphors of the Spirit's creative presence — all speak of how the world's life is connected with and related to God and how God enlivened into the material life of the Creation, so that the Divine mystery is to be experienced in our deep communion with nature. Hence the sacramentality of nature. The sacramental approach must help people to discover the Divine within nature and restore to human beings their position as children of nature³⁸. "Once human beings see in the visible universe the symbol of the Divine, their attitude to it will cease to be instrumental and will become reverential. Rediscovering the immanence of the Divine, however does not mean sacrificing the transcendence. The transcendence of the Divine will henceforth be seen as revealed in the self-transcendence of nature and history"³⁹.

The biblical image of God giving birth in us invites us to engage in creative action for change, arising out of what God is doing in us. God creates the world and then through us makes his wider presence. If we see ourselves as the place of divine birth giving, the natural response is to become co-carers with God of the world which is the fruit of divine fecundity; and sheer exploitation of nature begins to look like an offence against God Himself whose creative love bears all things in being. God pours into all creatures and fills them with His being. We imitate God if we similarly pour ourselves out in love to the world that God creates. "In an ecological perspective, the moral commitment is to be situated in a total relatedness of humankind and nature. Such a commitment will also include the double praxis of moving towards wholesome relatedness to forces disruptive of the wholeness of our symbiotic relatedness to Creation."⁴⁰

38 S. Kappen, "The Asian Search for a Liberative Theology" in *Bread and Breath: Essays in honour of Samuel Rayan S.J.* ed. T. K. John (Anand, Gujarat, 1991) p. 105

39. Ibid

40 S. Arokiasamy, "Doing Moral Theology in a Divided World" in *Bread and Breath Op. cit.*, p. 187

The biblical theology of inter-relationship would correct the Graeco-Christian arrogance that created a blind science and technology and consumerist culture. We should avoid any dichotomy between history and nature by moving away from the theological focus on "history" to "nature"⁴¹. "The history making character of man has been so much stretched and it has grown into monstrous proportions. The human subject and his/her freedom has today ended up in being dissolved into an objective rationality which claims the allegiance of man, or fritted away into the empirical and historical."⁴² Theology of creation should emphasize in a holistic and integrating biblical vision, ecology, justice and peace and link them all together. Ecological threats and injustice are inseparable parts of one whole. Neither can be pursued in isolation from the other. The emphasis on preserving Creation, for instance, still prompts fears that the work for justice will be compromised. Social issues cannot be separated from environmental ones. Combating injustice must find its root in affirming the gift of God's creation. One practical consequence of developing a theology of creation for the future will be discovering a more solid framework for confronting the reign of world-wide economic injustice by "ecological economics". Our approach to the question of justice is often one-dimensional. It divides the issues of ecology and justice. The bias of traditional theology toward anthropocentrism and its tendency to separate Redemption from Creation, has prevented a more integrated approach which is deeply biblical and demanded by contemporary realities.

A Christian theology of creation in future will have to take a cosmotheandric stand and move away from the traditional anthropocentrism that does not see humans as part of the cosmos but as transcendent to it. Humans are included in nature. Nature or cosmos is not outside of them. We are part and parcel of the cosmic whole "which has come to develop a mysterious interiority, the capacity for reflexive thought and freedom and love. The Earth is our bodily self, our common Body inseparably and for ever. This Body, all human persons have in common with all living things and with the entire cosmos"⁴³. Our cells obey

41 Kaufman, "A Problem for Theology: The Concept of Nature" in *Harvard Theological Review*, Vol. 65 (1972) p. 337

42 Felix Wilfred, *art. cit.*, pp. 73-74

43 S. Rayan, *art. cit.*, p. 120

bio-chemical laws. Our bodies are bound by gravity. We take life from the earlier instances of our species, pass that life along to our successors, and finally return to the Great Clod that receives all the bodies that tramp it⁴⁴. Human is not separate from the cosmos but is the "eye" of it, for he is its self-consciousness and should see himself as integral with the cosmic process, as the being in whom the universe reflects on and celebrates itself⁴⁵. Nature as our "home" should have its proper place in human history. "A chastened, sober anthropocentrism brings a consciousness that 'we are members of one another', also in view of the sub-human reality"⁴⁶.

The doctrine of creation has to be properly reconstructed as one "whole" groaning in travail together. Here cosmic redemption manifested in the archetypal image of "cosmic Christ" and human and nature evolving towards the Omega point, as conceived by Teilhard de Chardin, should carefully be developed. "Christ and cosmos — these two are but one single self-expression of God. There is no way of meeting the Son save by being a conscious part of his cosmic body."⁴⁷ A dynamic Christological vision of creation can assist people to be conscious of the transparency of God's presence in it. "Ecological responsibility is part of our praise of Creator and Redeemer"⁴⁸, while misuse of nature or environment would be a blasphemy as it is desecrating the "cosmic Host". As John Macquarrie says: "As far as Christian theology is concerned my thesis is that we need to move away from the monarchical model of God toward organic model"⁴⁹. We have to develop an "organic model" in the relations of God, human and world. Here insights from the Process theology of today could also be taken. Such a model would emphasize the mystery aspect of nature and would help us to overcome our narrow anthropocentric pride which led us to reckless exploitation of nature and unleashed such ecological damages as of today. The best example of this organic model in our theology is St. Francis

44 J. Carmody, *Holistic Spirituality*, (New Jersey, 1988) pp. 17-18

45 W. Teasdale, "Nature-Mysticism as the Basis of Eco-spirituality" in *Jeevadhara* Sept. 1990, p. 398

46 B. Haring, *Free and Faithful in Christ*, Vol. III (New York, 1981), p. 181

47 A. Pieris, *Op. cit.*, p. 16

48 B. Haring, *Op. cit.*, p. 179

49 J. McQuarrie, "Creation and Environment" in *Expository Times*, Oct. 1971, p. 8

Assissi who with the heart of a mystic had a passionate belief in the unity of creation and advocated a new "ecologic democracy" that recognized all life forms whether sentient or non-sentient as possessing ethical value and rights to existence and self-realization. "Since creation is the effect of God's fatherly love, that love led Francis to close union with all God's creatures"⁵⁰.

For reconstructing an adequate Eco-theology, we would greatly profit from the teaching of Eastern theology which claims to believe in a God who is not transcendent over all things, but who lives and acts in, with and through all things created by Him. Eastern theology stresses the cosmic union of all beings. Its doctrine of *Theoïs* could very well be reconsidered.

Some of our traditional theological concepts can be broadened and deepened by dialoguing with ancient Buddhist view of nature as a constantly changing flux of elements held together in human consciousness or the Hindu concept of the dance of Siva, the material universe forming the body, the field of energies (*sakti*) which is organized and controlled by the power of Siva's consciousness⁵¹. The Indian tradition puts much emphasis on the immanence of the Divine mystery in nature and in relations of God-human-nature. "The discovery of the Absolute in terms of the Atman-Brahman has enabled the Indian tradition to steer a middle course between sacralization of natural forces in the form of gods and/or spirits and secularization that looks on nature simply as an object that almost calls for exploitation and domination"⁵². Also Indian cultural holistic tradition with its emphasis on harmony in nature and the need for human to live in harmony with nature rather than exercise dominion over it, could be integrated into such a theology. Human and nature in Indian tradition seen in terms of wholeness and totality is governed by the law of *dharma* which assigns everything its proper place. To relate thus to nature meant adhering to *Rta* (dharma) the law governing all cosmic processes. And all labour not in harmony with *Rta* was an act of sheer violence done to Mother Earth, which explains their prayer: "Whatever I dig up of you, O Earth, May you of that have quick replenishment! O purifying One, may my thrust never reach

50 E. Doyle, *St. Francis and the Song of Brotherhood* (NY, 1981) p. 63

51 Bede Griffiths, *art. cit.*, p. 25

52 M. Amaladoss, "Ecology and Culture: Some Indian Perspectives" in Jeevadhara, Jan, 1988, p. 52

right unto your vital points, your heart?"! Other values of our culture like ecological *ahimsa* (non-violence and respect for life in all its forms) *karuna* and *maitri* (compassion and kindness for all beings) if integrated into our theology would help to form in us an ecological psyche with an ecological consciousness that would tame our violence and exorcize our barbarous destructiveness to nature⁵³. Together with this, Mahatma Gandhi's concept of *satyodaya* and trusteeship of all earthly goods are fruitful means to realize Bhagavat Gita's "lokasamgraha" -- the integration in the welfare of the whole world. "Indian spirituality has not sought a separation of humans from nature. Salvation essentially lies in seeking human identity and integration in oneness with the cosmic process. It is this out-door spirituality -- eco-spirituality -- which has been at the root of much Eastern religiosity"⁵⁴. Reverential intimacy with nature is a specific way of the East and, as Felix Wilfred says: "... great world-religions in Asia have perceived and lived the mystery of the Divine in intimate relationship to nature and this vision is a necessary complementarity to the Judeo-Christian tradition. If the Judeo-Christian tradition tends to the humanization of the universe, the other religious traditions tell us the way to the universalization of Man, namely the relationship of totality of reality in its divine and cosmic dimensions"⁵⁵. This complementarity can help Christian theology to respond to the environmental crisis. Thus our theology of nature need to be reconstructed in a "unitarian" structure to restore the right relation between God, human and nature. Such a theology while not disrupting the ecological nexus would maintain the priority and responsibility of the human. An adequate biblical Eco-theology can bring back the harmony and wholeness between human and human, human and nature and both with God that is the liberation and salvation of the whole cosmos.

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53. *Atharva Veda* XII, 1 as quoted in Parakkal Raimundo, *The Vedic Experience: Mantramajari*, (Pondicherry, 1983) p. 126

54. G. Therukattil, *art. cit.*, pp. 143-44

55. A. Veerara, "Eco-Spirituality and the Religious Community" in *Indian Theological Studies*, Vol. 28, n. 2, June, 1991, pp. 139-140

56. Felix Wilfred, *art. cit.*, p. 73

Ecological Ethics in a Divided World

Introduction

The rapidly increasing destruction of the environment and disruption of the eco-systems of our planet stare us in the face. The creeping chaos of the world reveals still more sharply its deep link with the divisions of the human community and oppressions and exploitation of people. Broken people and wounded earth, degraded environment through reckless greedy exploitation of nature and poisoning pollution go together. I do not intend filling pages with the frightening statistics and data that bear witness to the oppression and sufferings of people as victims of human injustice and greed and as refugees of the excessively exploited earth, environment and its resources. Every country has its own story to tell of its people thrown up as the disposable numbers by its policy and model of development in compact with modern science and technology and of its deforested landscapes, eroded soil, creeping deserts, polluted water and air.

If human intervention through technology for the purpose of development ignores the symbiotic relationship between human and nature, it will be guilty of introducing destructively irreversible processes of degradation of the earth and death of its eco-systems². Crisis of the eco-system of our planet reflects the deep crisis of

1. Cf. Steve Elsworth, *A Dictionary of the Environment*, Paladin Grafton Books, London, 1990 for all aspects of environmental degradation. On ecological crisis see *Shalom* by Ulrich Duchrow and Gerhard Liedke, W. C. C. Publications, Geneva, 1987, esp. pp. 16-35 on the "Destruction of Creation and the Oppression of Humanity". Cf. also *Social Movements* by John Desrochers, Bastian Wieringa and Vibhuti Patel, Centre for Social Action, Bangalore, 1991, ch. II, "Ecological Movements, Struggle for a Sustainable Society" pp. 74-119. *The State of India's Environment 1984-1985*, The second citizen's report, Centre for Science and Environment, New Delhi, 1985. The literature on the ecological crisis is massive. What is important is their dissemination for raising ecological consciousness.
2. While non-renewable sources of energy are being rapidly depleted, there is no serious research done on renewable sources of energy like solar energy, wind energy, etc. on the part of the powerful science establishment of the developed countries.

human society, its set of values and ethos. The earth, the mother of all living beings, bleeds. Mother earth has herself become a victim. We are faced with matricide (some call it geo-cide)³. We seem to be close to eco-cide which will be doomsday.

While the ecological crisis threatens the survival of all living beings, making all victims of the on-coming danger, the responsibility for this lies largely at the door of the human community. The ethics of autonomy which centred on the individual ignored the essential relationality of human person in community and integral relationality to nature. Coupled with narrow anthropocentrism and androcentrism it supported an ethos of individualism and enthroned man as master of all creation and as head of woman⁴. The irruption of the poor and the awakening of women showed the inadequacy of such an ethic and brought in an essential complementarity and healing wholeness to the ethical enterprise⁵.

The movements of environmental victims (like Chipko Movement, Narmada Bachao Andolan, Movement of fisherfolk, etc) reveal a wisdom that combines justice to people and wholeness of human relationality to nature, together with a critique of the development model adopted by the state and of the values on which it is based⁶.

We understand that an eco-ethic focuses on obligations towards wholeness of human life built on justice, freedom, participation, dignity and solidarity and its organic connectedness to nature and its eco-system. Obligations of justice to people and their well-being, prevention of nature's degradation and preservation of its wholeness, its conservation and enhancement belong to our way of being and acting in the symbiotic relationality of human and nature. Eco-ethic in a divided and wounded world will call for new perspectives that promote liberation of humans and integration of human life with nature. It will involve a value critique of science, technology and development model. It will call for a critique of the world-views of religions that supported one-sided or dualistic views and their positive values as source for liberative and ecologically wholesome perspectives for a sound eco-ethic⁷. We must revise and expand our understanding of ethics of responsibility for a world that is just and earth as home for all generations of humans and other living beings of the planet⁸.

3 Cf. 'Christians and the Ecological Consciousness' *Pro Mundi Vita*, Feb.'90, p.3

4 Cf. Vandana Shiva, *Staying of Alive Kali for Women*, Delhi, 1988, esp. chs. 1 and 2. cf. also *Social Movements* by Desrochers, Wielenga and Patel, chs. 3 and 4. 5 Ibid. 6 *Social Movements*, pp. 83-87

7 Cf. G. P. Dwivedi (ed.), *World Religions and Environment*, Gitanjali Publishing House, New Delhi, 1989, pp. 309-314 on a balanced critique of religions' contribution to environmental conservation.

8 Gerard Siegwalt "La Crise Ecologique, un Defi pour la Pensee, Pour la For

Relational ontology and anthropology

No human is an island nor any being a monad. All are inter-related. To be is to be related. To be human is to be inter-human and to be related to every being in the cosmos. Nature is a web of relations⁹. Denial of relationality is denial of being. Human beings and nature are constituted in a net-work of complex relations.

Relational constitution of being calls for a relational way of knowing reality. To know human being is to know him/her in his/her relationality. To know reality is to know it in its relationality. This means we have to expand the boundaries of relationality of human community to include the greater relationality of all living beings, the earth and the cosmos. Narrow anthropocentric relationality of human beings disturbs the harmony of the human community and damages the greater community of humans and nature through sins of commission of exploitation, rape and pollution of our earth and the planet under the influence of egotistic and dualistic world-views and omission in caring for the integrity of the earth and the wholeness of the planet. Ecological crisis goes with crisis in the human community and its survival. Sustainability of human society and sustainability of the earth are both endangered.

The earlier formula of W.C.C.'s plea for "a just, participatory and sustainable society" in the 70's stops short of attention to the deep organic connectedness of human life and integrity of nature¹⁰. In the 80's the theme of the General Assembly (Vancouver, 1983) has expanded the earlier formula into "Peace, Justice and Integrity of creation"¹¹. Sustainability of a just, participatory society goes with sustainable earth. This formula concretises the ecological crisis and the new ethical mandate in a divided world by coupling just and participatory society with integrity of creation. W.C.C. prefers to speak of 'integrity of creation' rather than integrity of nature. The term creation is rich in biblical theological meaning of the gifted goodness of all created reality

et pour la Praxis" in *Le Supplement* no. 169, Juin, 1989, p.p. 98-99. Cf. also S. Arokiasamy "Doing Moral Theology in a Divided World" in *Bread and Breath* ed. T. K. John, G. S. P. Anand, 1991, pp. 188-190.

9 Chief Sennie "Man did not weave the web of life, He is merely a strand in it" quoted in *Dancing of Shiva in the Ecological Age* by Henryk Skolimowski. Clarion Books, New Delhi, 1991 p. 93.

10 Cf. Paul Alerecht, *Faith, Science and the Future*, W.C.C., Geneva, '78. pp. 1-10

11 In 1983, the Vancouver Assembly of W. C. C. appealed to the Churches to engage in issues of Justice, Peace and Integrity of Creation (JPIC) as a priority for World Council programmes. The Canberra Assembly pleads for "justice ethic of sustainability...which brings together the imperatives of economic justice with the demands of ecological sustainability" quoted by Wesley Grauberg-Michaelson "An Ethics for Sustainability" in EC. Rev.

by the Creator (Gen. 1:25-31). It calls attention to the intrinsic value of creation according to the original creational intent of God. The same expression of integrity of creation instead of sustainability is better adapted to express the value of nature while the concept of sustainability can consider nature (the non human creation — living beings and the elements of the earth) as a deposit of resources for human exploitation. Sustainability can also mean that nature is conceived within a framework of machine metaphor connoting a 'techno view' of nature¹². It cannot express appreciation and respect for the value of nature and care and concern for it. Such a concept of sustainability supposing an instrumentalist view of nature is part of the model of modernising development based on science and technology followed by developed and developing countries. Shiv Viswanathan makes a pertinent critique of Mrs. Bruntland's Report on its concept of sustainable development¹³. According to him, sustainability is understood in a framework of modern science and technology and the model of development based on it, in which nature is considered basically in the sense of its being a mine of resources to be exploited while attending to its limits. The value of care and concern for nature and its integrity which constitutes sustainability is incompatible with the modern science and technology rooted in Cartesian and Baconian scientism.

Intrinsic values and reverence for life

In a relational perspective, human and nature belong to a set of graded values. The big change demanded is a cultural, social and spiritual metanoia for the intrinsic value of nature, respect and reverence for what is, transcending purely utilitarian considerations¹⁴. In this perspective, purposive nature of every being in relationality is recognised. It is respect for integrity of nature which redounds to the well-being of man. We cannot have a liberative eco-ethic which considers nature as a bundle of resources to be exploited with efficiency and attention to its limits¹⁵. A sound liberative eco-ethic can be built only on the value of intrinsic relationality of human and nature.

Vol. 42, no. 1, 1991, p. 128. Cf also *Biblia Y Fe* 16, 47, Mayo-Agosto, 1990. The whole number is devoted to "Ecologia Y Teologia".

12 Cf Jose Miguez Bonino, *Towards a Christian Political Ethics*, SCM, 1983, p. 13. Cf also S. Arokiasamy "Technology and the Future" in *Vidyajyoti* 50 (1986) pp. 399-401

13 Shiv Viswanathan "Mrs Bruntland's Disenchanted Cosmos" in *Alternatives* Vol. 16 (1991) pp. 378-379

14 Cf. Skolimowski, *Dancing Shiva in the Ecological Age*, p. 94. J. B. McDaniel, *Of God and Pelicans: A Theology of Reverence for Life*, Westminster/John Knock Press, Louisville, 1989, ch. "A Life-Centred Ethic" pp. 51-84.

15 Cf. Vandana Shiva, *Ecology and the Politics of Survival*, Sage Publications, New Delhi, 1991.

Human behaviour of respect for integrity of nature calls for a sacramental view of nature; the goodness and beauty of nature are adequately expressed in symbolic language. The intrinsic value of non-human life and the earth is expressed in myths, stories and symbols. In strengthening our moral commitment to the value of nature and its integrity, we need the language of St. Francis of Assisi who sang of Brother Sun, Sister Moon and Mother Earth¹⁶. Indian tradition is rich in this imagery. Ecological crisis has shown the rapidly advancing rupture of this symbiotic relationality on which depends the sustenance and survival of all life on our planet. Modern science and technological innovations including bio-technology and genetic experiments have functioned with the premise that non-human life exists for humans alone and that it can be endlessly instrumentalised for their benefit.

To avert the disaster of the death of all life we need to convert ourselves from utilitarian value of life to intrinsic value of life. For this we recognise that there is a gradation in the intrinsic value of life. This recognition is essential for a liberatively balanced eco-ethic that promotes the justice of human society and integrity of all life. We understand reverence for life in this sense. Ethical obligation of reverence for life is not just romantic and sentimental concern for life but a discernible historical imperative linked to just participatory human society and integrity of nature. Our reverence for life is part of a perspective which recognises both the intrinsic and inalienable dignity of the human and the intrinsic value of nature within the greater relationality and interdependence of all beings. Without discernment of gradations of intrinsic values of human life, non-human life and the earth, we will be accepting the status quo of oppression of people, destruction of life and nature. Moral maturity and conscience is rooted in a perspective of graded values. Otherwise human beings humiliated and destroyed and sacred animals worshipped and protected will become an outrageous contradiction of our values and beliefs. In Indian religions, universal compassion and *ahimsa* towards all living beings must include the gradations in the value of life¹⁷. Without this, these very virtues can be a source of unjust social discrimination and lead to convenient practices of soul-soothing while the selfish industrialists and businessmen will be engaged in big money-making and exploitation. India abounds in such examples¹⁸.

Science, technology and model of development

Ecological awareness cannot but make a critique of sciences, technology and development model adopted by both developed

16 Cf. Song of Creation of St. Francis of Assisi.

17 Cf. *Journal of Dharma* 16 (1991) on Ahimsa and Ecology, which presents the contributions religious traditions can make for ecological wholeness.

18 Cf. Dwivedi, *World Religions and Environment*, p. 314

and developing countries. The modern state functions under the premise that science and technology can solve problems of underdevelopment and promote prosperity of human community. On the contrary, science and technology adopted by the modern state are part of the problem, and not part of the solution. The Cartesian and Baconian origin of modern science is dualistic, severing the vital relationality of human and nature. Science is supposed to overpower, tame and control nature and humans to subjugate nature and extract from it all that it can yield to make human life happy and prosperous. According to Francis Bacon science stands for the power and dominion of man over the whole world of nature¹⁹. There is a close link between science, power and violence. In this view, "nature was an enemy which needed to be defeated and tortured...so that its secrets or powers could be extracted for the benefit of the human race"²⁰. What is important to note is that science and technology in their proven triumph of knowledge over nature is also power over indigenous peoples and violence against justice, freedom and culture of peoples²¹. The period of science and technology is also the period of colonial subjugation and slavery. Bacon's language of science reflects the violence of modern dualistic science: Man can put nature on the rack provided he can extract secrets from her²².

The modern state in its approach to development is in close compact with science and technology that embodies triumphs of control, manipulation and exploitation of nature. Shaped by the ideology of science and technology the modern state perpetuates a fundamental power-divide in society in which the elite make decisions for others, for their lives and destinies, denying them participation in the economic and political affairs of the state²³.

The dualistic science views nature only in a utilitarian and instrumentalist perspective. Nature does not have any intrinsic value. In the reductionistic, rationalistic science there is no room for value or intrinsic goodness and beauty of nature which evokes a sense of reverence, or for any sense of the sacred or of the sanctity of life. These values and attitudes that go with it cannot be reduced to equations or purely managerial efficiency. Rather they touch our very being human in a relational and holistic sense. An eco-ethic must be supremely based on this perspective.

19 Duchrow and Liedke, *Shalom*, pp. 65-67. Vandana Shiva, *Ecology and the Politics of Survival*, pp. 33-56.

20 Ashis Nandy (ed.), *Science, Hegemony and Violence*. A Requiem for Modernity, London, Oxford, U. P., 1988, p. 14; S. Rayan, "Ecology and Theology" in Mangalore Diocesan Chair in Christianity *Journal*, 3, Sept, 1991, pp. 1-38

21 Duchrow and Liedke, *Shalom*, p. 66, Vandana Shiva, *Ecology and Politics of Survival*, p. 19-24

22 For Bacon's view of Science and Nature, cf. *Shalom*, p. 66

23 Cf. S. Arokiasamy "Power in Relation to Society" in *Social Sin*, ed.

Vandana Shiva in her book *Ecology and the Politics of Survival*²⁴ shows how traditional societies functioned over cultures with a knowledge system ecologically sensitive to nature, a technological system that handled resources to satisfy human needs with minimum of waste and operated with rational criteria that distinguished between resource destructive and resource enhancing technologies. This is in total contrast to modern science which is reductionistic and fragmented and technologies developed by it are generally resource intensive. It tragically falters between choices of resource use efficiency and need satisfaction potential for want of adequate rational criteria.

From the experience of ecological movements of protest for justice and nature conservation, Vandana Shiva speaks of an emerging public interest science which recognises relationships and interdependence among the various components of nature, assigns value to nature assessing its work in this web of interdependent relationships and locates nature's processes that support survival, going beyond profitability²⁵. Reductionistic science fails to take into account properties of nature that result from relationships in nature. This means that ecological sustainability, justice and well-being of all humans call for an alternative epistemology and science based on knowledge of the processes of relationships of nature and respect for relationality and interdependence. The alternative of public interest science has a critical role to play in the politics of knowledge and politics of environment and a constructive role in generating new paradigms of science, technology and development that support and promote integrity of nature and justice²⁶.

Public interest science brings criteria of ecological sustainability and justice in auditing technological choices and its politics. In this audit people who are the underside of society participate so that just, participatory society, sustainable development and integrity of nature are promoted and resist false models of development that destroy life support systems of the earth. People of the underside will face continually the conflict between the profitability and survival imperatives in the politics of knowledge and science. Eco-ethic has to create awareness of values and endow with power to act and to make covenants and commitments for a development that promotes justice and sustainability.

Can world religions support a liberative eco-ethic?

I do not intend studying texts and writings of religions that have bearing on our ecological crisis. Of late studies and statements have been published on the contribution religions can

S. Arokiasamy and Felix Podimattom, Claretian Publications, Bangalore, 1991, pp. 15-45.

24 V. Shiva, *Ecology and Politics*, pp. 39-41

25 Ibid., p. 48

26. Ibid., pp. 50-55.

make towards solutions to the ecological crisis²⁷. I hold that religions can and should answer the ecological question. Their specific contribution bears on perspectives of human life, life of other beings, earth and cosmos and their interconnectedness and the values and attitudes religions inculcate for our life in common. The paradigms of world-views they contain communicate a spiritual vision and generate values and attitudes for human behaviour. Their explicit or latent meanings for a liberative wholesome eco-ethic need to be articulated within a critical view of these religious traditions in history.

Christianity and Islam present human as the crown of creation and as God's vice-gerent. These images in relation to nature in the context of ecological crisis need rethinking. Hinduism and Buddhism present human as a constituent and an integral partner of nature. They need to be interpreted in relation to justice and wholeness of the cosmos²⁸. The wisdom of religions is eco-sensitive to human-and-nature relationality. But a re-reading of this wisdom that carries a concern for justice and conservation of nature becomes a common agenda of a wider ecumenism of all religions. Above all it should inform, influence and shape a new collective ethos and culture that will render a continual value audit of public policies and decisions of governments in the areas of economics, technology and development. All religions have to enter into an interreligious project to respond to justice and integrity of nature²⁹.

In Christianity, there is an awakening to the ecological crisis and even a sense of guilt for a tradition of interpretation of human as charged with dominion over nature. Creation account in Genesis (1:26-28) speaks of dominion given to human by God. The one-sided incomplete interpretation of it neglected the deeper understanding of human and all other creation coming from the hands of God, the source of all life and beings and the total dependence of all on this absolute source and the consequent interdependence of all. The attempt at re-imaging dominion as stewardship though better than imaging human as sovereign who can dispose of nature as he wills, is still not adequate, for stewardship as a category of responsibility supposes that nature is a deposit of resources which can be used responsibly. We need to include a relational view that human is a partner and a servant, intelligent and creative, in a community of relationships in which interdependence, cooperation and conservation become important values. In this view, nature is not merely a deposit of resources to be used though responsibly but a source and support of all life.

27 Cf. Dwivedi, *World Religions and Environment*, esp. the Appendices on Declarations on Religion and Nature made at Assisi, 1986, pp. 319-336

28 Ibid., pp. 312-313.

29 Ibidem, the Appendices.

The symbolic stories of creation of man and all creatures from the earth (*adama*) point to a common belonging of both³⁰. In Genesis 2:15 man is called "to cultivate and keep the earth". To cultivate and to keep the earth (*abad/shamar*) could also mean 'serve' and 'guard' the earth. This means that humankind is not just master of creation but servant. He is called to serve the earth (*abad adama* cf. Gen 2:5). Through sin this belonging to the earth and the vocation to serve and care for the earth are broken. The punishment itself, as Kahl interprets³¹, "till you return to the ground, for out of it you were taken; you are dust and to dust, you shall return" (Gen. 3:19) becomes an expression of a final metanoia or conversion of humankind to *adama* (earth) and a sort of reconciliation after the original betrayal of the task of *abad adama* (service of the earth). Kahl observes that human work as cultivation or service of the earth (Gen 2:15) is the first and basic statement on "culture" in the Bible³². Christian faith should contribute towards an eco-sensitive culture and eco-ethic of responsibility for the integrity of creation and repair the damage done by the culture of domination and subjugation of the earth through its non-liberative narrow anthropocentrism. The Gospel reversal is that the human who is master has to become servant of all living beings, including human.

Biblical perspectives that affirm deeply the relatedness of human and nature and the created goodness of all beings (Gen. 1:31) and all life and God's care for and covenant with human and living beings (Gen. 9:8-10) as their ultimate source need to be developed as orientations for a new style of life and provide value perspectives that influence culture, education and public policy.

Translating the ecological wisdom of religious traditions into imperatives and strategies for transformation of economics, politics and culture, and alternatives that nurture and enhance justice and integrity of nature is the most urgent task. I stress this because there is an approach which rest satisfied with repetition of texts in religious scriptures that have wholistic world-views and enter into a boastful parade of doctrine in isolation from the struggles and crises which call for concrete historical commitments and actions. In this regard religions of the East and the West can be offenders. In an ecological ethic, we have to develop and articulate the wholistic views of Hinduism, Buddhism and Sikhism. At the same time we are also aware that India that is the cradle of these great religions is tottering under the impact of the destructive compulsions of world capitalism and obsessive consumerism and suffer from deep unjust divisions of society. A country like Myanmar that accepts Buddhism as a state religion is marred by

³⁰ Brigitte Kahl "Human Culture and the Integrity of Creation" in *Ecumenical Review* 39 (1987) pp. 129-132

Ibid., p. 130-131.

³² Ibid., p. 131

anti-democratic military rule. Can religions wage politics for justice, dignity of people and ecological sustainability inspired by the resources of their own traditions? Can they contribute to the creation of a just participatory society and sustainability of nature?

Little traditions and people's movements from the underside

It is not enough that the so-called great religions enter the fray. The people of little traditions, i.e., tribals who are usually the marginalised and ecological movements waged by victims of modern development hold a promise for politics of justice and ecological conservation. Until the voices of the little people are heard and their wisdom listened to, all our struggle for justice and eco-integrity stand the danger of being sucked into the megapower of the modern science and technology under the banner of capitalism.

The adivasis of our country have a millennial tradition of life in close kinship with land, mountains and forests as gift of the Supreme Spirit. In their strong communitarian and egalitarian ethos and way of life land, forests and mountains are not commodities to be bought and sold but source and support of life and symbols of God's provident care and love. But today tribals have become refugees of modern industrialisation and thus uprooted they are easily discounted in all mega-projects of dams and industries. The paternalistic talk of rehabilitation of displaced tribals totally ignores their cultural heritage and values. The outrageous fact is that even today their rehabilitation remains empty promise. Moreover, the concept of rehabilitation is devoid of justice. It can be just only if it is implemented through strict compensation embodying justice. The environmental refugees of Narmada and other dams ask for justice. The agents of modern development and progress promise begrudged crumbs of rehabilitation. This shows that the projects of development which do not start from the stand-point of the oppressed cannot bring about justice and equitable development.

The ecological movements from the underside of the exploited reveal the inadequacy and non-sustainability of development followed by the State and points to the need for another direction of development which secures justice and ensures integrity of nature³³. These movements are redefining the concept of development for a new civilisation. Would the captains of modern development listen to them? In the past in the Americas the Indians echoed a wisdom in life in relation to nature that can become a radical critique of the depredatory violence of modern science and development. The oft-quoted letter of the Chief Seattle sounds a powerful warning to the modern ethos of commercialistic resource-intensive limitless progress.

3 Vandana Shiva, *Ecology and Politics*, p. 23

"The great chief in Washington sends word that he wishes to buy our land...How can you buy or sell the sky, the warmth of the land? The idea is strange to us. If we do not own the freshness of the air and the sparkle of the water, how can you buy them? Every part of the Earth is sacred to my people. We are part of the Earth and the Earth is part of us. The perfumed flowers are our sisters; the deer, the horse, the great eagle, these our brothers. The rocky crests, the juices in the meadows, the body heat of the pony and man — all belong to the same family."³⁴ The wisdom of the Homeland people of Americas and the insight of people's struggle for survival hold a promise for a new vision of society which says 'no' to destructive technologies of modern development and calls for non-destructive technologies and a model of development that conserves nature as precious patrimony or all generations of human and other living beings³⁵.

Agenda for a liberative ethic of ecology Antyodaya as starting point

Response to ecological crisis is eminently an ethical task. The unjust division of human society and rupture of eco-wholeness point to the degradation (chaos) of the universe (cosmos), the home (*oikos*) common to human and all other living beings. To build the community all as *oikumene* in a harmony of right relations and thus ensure justice, sustainability and well-being of all now and for the future is a historical task. In a divided world ecological ethics will make the wounded world and nature as its point of departure. It calls for liberated wholeness of human society and integrity of nature. The standpoint from which ethical understanding and commitment should flow is the underside of human society, the victims and refugees of modern development. To listen to their cries for justice, peace and wholeness should ever remain as a necessary starting-point in our response to the ecological crisis. Thus the structure of moral commitment will include commitment to the liberation of the exploited and oppressed of our modernising society³⁶. Without this *antyodaya* which is justice, freedom, life and dignity for the wretched of the earth our struggle for the wholeness of the biotic community of the earth and the conservation of nature (*sarvodaya*) would be flawed and would ideologically favour the status quo.

Corruption of human social order and degradation of environment are two sides of the same global catastrophe. Deeper analysis of the crisis shows that no amount of struggle for ecological wholeness, if divorced from the struggles of people for

34 Cf. S. Rayan "The Earth is the Lord's" in *VJTR* 54 (1990) p. 126

35 For the statement of Chief Seattle, see *Social Movements*, pp. 219-221. S. Rayan "The Earth is the Lord's" in *VJTR* 54 (1990) pp. 124 & 126

36 S. Arokiasamy, "Sarvodaya through Antyodaya, the Liberation of the Poor in the Contextualisation of Morals" *Vidyaajyoti* 51 ('87) pp. 545-564. Cf. also "Liberation Ethics of Ecology" by the same author in *Jeevadhara* 18 (88) pp. 32-39

basic needs and survival and therefore for justice, can make for sustainability of the earth³⁷. The relational perspectives discussed at the beginning of the article should figure prominently in any ethical discourse on peace, justice and sustainability of the earth.

Human dignity and habitable earth

Human dignity traditionally understood in the framework of narrow anthropocentrism reinforces the idea of human being as crown and master of creation leading to rapacious human dominion over it. It needs to be revised in relational terms of co-existence and pro-existence and service for the integrity of creation. It calls for the realisation of that human dignity lived in harmonious relationships with other living beings which have their own intrinsic value. Since human belongs to a relational world and a community of relations, his/her specific dignity should manifest itself in his/her care for the earth and service for the conservation and enrichment of the relational world of human and nature.

The specific excellence of *human freedom* (autodetermination) is to be defined by its purpose. It cannot mean to be a value in itself connoting alienation from relatedness of human beings among themselves and with all other beings. If human freedom is relational freedom, it should be exercised in relationality and for relationality. Its value and dignity consists in the contribution human person can make through his/her choices and decision towards building up relationality that is liberative and creative of the community of human and nature and resists all lure to destructive choices. Relationality points to the purposive nature of human freedom.

Human knowledge must contribute its insight into the relational nature of all beings. Knowledge promoted by modern science is fragmenting and dichotomising. We need a new kind of knowledge that brings deeper understanding of human solidarity and relatedness of human beings with nature. Ecological ethic should criticise reductionistic and alienating system of knowledge and stress the need for holistic and relational vision of reality. Only on the basis of the latter can ecological ethic discern the new imperatives for justice and sustainability.

Human rights and rights of the earth

Today in the situation of ecological crisis all discourse on human rights should include an ecological perspective. In our country, people's movements for human rights are often linked to injustice done to people through environmental destruction, the end-result of modern technological choices and industrialism³⁸. When we link human rights to development with sustainability of nature, we have to speak of our duties towards the earth. We know

37 Cf. V. Shiva, *Ecology and Politics*, pp. 13–56 on justice and sustainability.

38 *Social Movements*, pp. 87–9

that in Indian approach to ethics, duty (*dharma*) has primacy over rights. Every right calls for a corresponding duty: the right to justice for the duty to do justice, the right to life for the duty to keep life (respect and reverence for life). Similarly right to a healthy clean habitable environment calls for the duty to keep and care for such an environment.

We can also speak of rights of nature/earth which correspond with the duty to care for the earth. Of course we speak of rights of nature/earth in an analogous sense. To understand rights of the earth, we have to envisage the earth as the home for humans and all other life, the womb of all living beings. That is why we in India call earth Mother as Amerindians did³⁹. Her health and strength is being sapped by reckless and greedy rape by humans supported by modern technology and industrialisation. Soil erosion, deforestation, pollution of the air and creeping desertification of the earth's surface are violations against Mother Earth. She is denied her right to rest, to sabbath by which she renews herself. Moltmann develops this idea as sabbath of creation⁴⁰. We may ask how the Mother Earth can generate life and support her children? The earth's rights to wholeness cannot be exercised by her as humans do. It is humans, children of the Mother earth (*adama*) who have to give voice to her rights by their care and conservation. If we neglect this duty, we reap her punishments by way of environmental degeneration and disruption of the eco-system of the earth.

Ecology and common good

Pope John XXIII defines common good as "the sum total of those conditions of social living whereby men are enabled more fully and more readily to achieve their perfection" (*Mater et Magistra* no. 65). The concept of common good is central to the social teaching of the Church. In a situation of ecological awareness it should include the dimension of healthy and harmonious relatedness of humans to nature in the sum total of those conditions of social living for their total well-being. If justice is the core of the common good, justice due to humans should be integrated with justice due to the earth. Environmental conservation and ecological wholeness are essential to interhuman and social justice. Environmental issues are justice issues related to people's basic needs for survival, dignity of life, health and well-being.

The expansion of the common good to include environmental conservation and balance of the eco-system of our planet, besides justice and peace of human society, will demand a new way of articulating the imperatives of social good. It is heartening to note that ecological concern has entered the social magisterium of the Church⁴¹. "Peace with God" calls for friendliness

39 Cf. f. n. 34.

40 Jurgen Moltmann, *Creating a Just Future*, SCM Press, London, 89 pp. 61-66

41 John Paul II speaks of 'ecological concern' in *Sollicitudo Rei Socialis* no. 26;

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with nature, as exemplified in the life of Francis of Assisi; "fraternity with all the good and beautiful things of God's creation, lies within the 'greater and higher fraternity which exists in the human family'"⁴². The common good is the integrated bonum of both human and nature. Creating ecological consciousness for justice and sustainability is a task of the church's social teaching. It should help towards the formation of ecological conscience that facilitates our moral decisions and choices which reckon with eco-relatedness of our life.

Responsibility and ecology

There is both individual and collective, local and global responsibility to preserve justice and peace (shalom in the biblical sense) and integrity of creation. It is a challenge to the whole human community⁴³.

If the earth is the home for all humans of both present and future, as well as all other living beings, responsibility extends to inter-generations and future generations. This means that we must guard ourselves against all egoistic or onesided understanding of responsibility; it should look forward to future generations' right to a habitable earth. In this exercise, responsibility should concern the qualitative parameters of justice, life and sustainability which hold good for the present and for the future. For this, we have to rid ourselves of all greed and possessive spirit, cultivate *aparigraha* and *asteya*, and such social behaviour as promotes life and conserves integrity of nature.

Politics of ecology

Restructuring of economic development and political system and promotion of a new kind of knowledge through cultural action call for a politics of ecology. The existing order of economics and politics and the realm of culture are in league with the model of development which is guided by the dominant forces of modern science and technology under a capitalist mode of production that survives on competitive market and consumerism promoted by it. In this system, justice, active participation of the people and sustainability have no structural priority. Hence confronting this system and working for an alternative order calls for a new politics of the people from below as symbolised by their movements for justice and sustainability.

The Chipko Movement (a non-violent struggle by tribal women to prevent the commercial felling of trees and forests which is the life support of tribals), the fisherworkers struggle to preserve

cf also Peace Day Message of the same Pope "Peace with God", '90, no. 1; cf also *Gaudium et Spes*, 34.

42 "Peace with God" no. 20.

43 J. Moltmann, "Has Modern Society a Future?" in *On the Threshold of the Third Millennium* ed. by Philip Hillyer, Concilium SCM Press, London,

'the resource base of their livelihood, the coastal eco-systems and marine life', the struggle against big dams (Narmada Bachao Andolan), the successful struggle against the Silent Valley Project and other similar struggles have important lessons to all for a new kind of participatory politics coming from the underside of the victims of environmental destruction⁴⁴.

In a political ethic for ecology, we are aware of the structural sin of the mechanisms and ideologies of exploitation. A liberative politics of ecology can only be one that emerges from those who have been sinned against and from the consciousness of the earth that has been sinned against. It has to become effective at both the local and the global levels. The "greening" of global politics for ecological conservation can take place only through the values of justice, participation and sustainability.

Conclusion

Ecological ethics demands justice, peace and sustainability which will contribute to the formation of an ecological conscience in the context of a divided society and wounded nature. Being conscious of the interconnectedness of all things, the symbiotic relationship of human beings and nature, the limits to earth and its resources, learning the value of human and non-human life, cultivating gratitude to and reverence for life and promoting wholistic world-views and culture constitute the educational agenda of ecological ethics. In this enterprise, the cooperation of religions forms an inter-religious project to build the oikumene of earth as the home of all human and non-human life. Ecological ethics in a divided world is a dynamic ethics that evolves through interaction, dialogue, cooperation with all peoples and traditions so that *shalom* of our *oikos*, the earth, becomes a blessing for all peoples and for all living beings and for all generations. We are not spared the struggles to confront and overcome forces of rupture and disintegration.

The interconnectedness of all the living and non-living becomes the primordial 'constitution of relationality' given by God the Creator for the life of human beings and nature. It is by this constitution that we order our lives in justice and peace and enhance and conserve life sources; we in turn hand it on, in its integrity, to future generations. It is a covenant for peace, justice and the integrity of creation⁴⁵.

S. Arokiasamy

1990, pp. 54-65. Cf Christian Link "Ecological Crisis and Christian Ethics" in *Theology Digest* 31 (1984) pp. 149-154.

44 *Social Movements*, pp. 83-87.

45 Cf. *Resources for Sections*, the Theme, sub-themes and Issues, World Council of Churches, Seventh Assembly, 1991, Geneva, 1990, pp. 97-115.



